NATURAL BRINES OF INDIANA AND ADJOINING PARTS OF ILLINOIS AND KENTUCKY

by

FRANK H. WALKER

Indiana Department of Conservation

GEOLOGICAL SURVEY

Report of Progress No. 13

1959

STATE OF INDIANA
Harold W. Handley, Governor

DEPARTMENT OF CONSERVATION
E. Kenneth Marlin, Director

GEOLOGICAL SURVEY
Charles F. Deiss, State Geologist
Bloomington

Report of Progress No. 13

NATURAL BRINES OF INDIANA AND ADJOINING PARTS OF ILLINOIS AND KENTUCKY

by

Frank H. Walker

Printed by authority of the State of Indiana

BLOOMINGTON, INDIANA

April 1959

For sale by Geological Survey, Indiana Department of Conservation, Bloomington, Ind.
Price 75 cents

SCIENTIFIC AND TECHNICAL STAFF OF THE GEOLOGICAL SURVEY

CHARLES F. DEISS, State Geologist
JOHN B. PATTON, Principal Geologist
BERNICE M. BANFILL, Administrative Assistant to the State Geologist
MARY BETH FOX, Mineral Statistician

COAL SECTION

CHARLES E. WIER, Geologist and Head
G. K. GUENNEL, Paleobotanist
S. A. FRIEDMAN, Geologist
HENRY H. GRAY, Geologist
HAROLD C. HUTCHISON, Geologist
RICHARD C. NEAVEL, Coal Petrographer
LARRY LAWRENCE, Geologic Assistant

DRAFTING SECTION

WILLIAM H. MORAN, Chief Draftsman
ROBERT E. JUDAH, Geologic Draftsman
MICKY P. LOVE, Geologic Draftsman
JOHN E. PEACE, Topographic Draftsman

EDUCATIONAL SERVICES

R. DEE RARICK, Geologist and Head

GEOCHEMISTRY SECTION

R. K. LEININGER, Spectrographer and Head
MAYNARD E. COLLER, Chemist
LOUIS V. MILLER, Coal Chemist
E. M. CRAIG, Technician

GEOPHYSICS SECTION

MAURICE E. BIGGS, Geophysicist and Head
ROBERT F. BLAKELY, Geophysicist
CHARLES S. MILLER, Instrument Maker
ALBERT J. RUDMAN, Geophysicist
JOSEPH F. WHALEY, Geophysicist
JOHN D. WINSLOW, Engineering Geologist
GLEN L. WORKMAN, Driller
JERRY B. FOX, Assistant Driller
ARTHUR WAYNE AYNES, Technician

GLACIAL GEOLOGY SECTION

WILLIAM J. WAYNE, Geologist and Head
W. HARRISON, Geologist

INDUSTRIAL MINERALS SECTION

DUNCAN J. McGREGOR, Geologist and Head
GARY R. GATES, Geologist
SEYMOUR S. GREENBERG, Petrographer
JACK L. HARRISON, Clay Mineralogist
NED M. SMITH, Geologist
JACK A. SUNDERMAN, Geologist

PALEONTOLOGY SECTION

ROBERT H. SHAVER, Paleontologist and Head

PETROLEUM SECTION

T. A. DAWSON, Geologist and Head
G. L. CARPENTER, Geologist
OLIN R. HOLT, Geologist
ANDREW J. HREHA, Geologist
STANLEY KELLER, Geologist
ARTHUR P. PINSAK, Geologist
HOWARD SMITH, Geologist
DAN M. SULLIVAN, Geologist
FRANK H. WALKER, Geologist
GEORGE ABBOTT, Draftsman
JAMES CAZEE, Sample Curator
PHILLIP W. CAZEE, Sample Curator

PHOTOGRAPHIC SECTION

GEORGE R. RINGER, Photographer and Head

PUBLICATIONS SECTION

GERALD S. WOODARD, Editor and Head

Page

Page

This page intentionally blank

NATURAL BRINES OF INDIANA AND ADJOINING PARTS OF ILLINOIS AND KENTUCKY

By Frank H. Walker ABSTRACT

This preliminary report on the natural brines of Indiana and adjoining parts of Illinois and Kentucky is a compilation of 473 brine analyses. The analyses were obtained from the files of many companies as well as from published reports of the Indiana, Illinois, and Kentucky Geological Surveys. The analyses are classified on a stratigraphic basis and cover stratigraphic units that range from the Knox Dolomite (Cambrian and Ordovician Systems) to the Pennsylvanian System. The locations of wells or leases from which samples were obtained for 11 units of the Chester Series and the Ste. Genevieve Limestone (Mississippian System) are shown on maps. The total solids in parts per million of the brines sampled from these stratigraphic units also are shown on the maps.

A comprehensive brine-analysis program has been started by the Indiana Geological Survey. This program will result in a relatively detailed publication on Indiana brines.

INTRODUCTION

The program of gathering and compiling data on the natural brines of Indiana, with emphasis on produced oilfield waters, was begun at the request of the Tri-State Association of Petroleum Engineers. Representatives of the Association and members of the Advisory Committee to the Indiana State Geologist met with personnel of the Indiana Geological Survey to formulate the program. Those who took part were J. R. Atkinson, Inland Producers, Inc.; John Penrod, James A. Lewis Engineering, Inc.; William Bowen, Schlumberger Well Surveying Corp.; E. J. Reading, Sun Oil Co. I - J. D. Turner, Independent Oil Producer; Charles F. Deiss, John B. Patton, T. A. Dawson, R. K. Leininger, and Frank H. Walker, Indiana Geological Survey.

The brine program, as formulated, consists of two parts. The first part consisted of collecting all published brine data and all brine data obtainable from the files of oil producers and petroleum-engineering firms. The second part will consist of collecting and analyzing brine samples, as needed, to supplement the data acquired from published sources and from company files.

On completion of the first part of the brine program, the group that had outlined the program met and reviewed the collected data.

The group then decided that publication of information on Indiana brines should not be held up until the second part of the program could be completed and that the data already collected, although relatively meager, should be published as this report of progress.

The second part of the program--that is, collecting and analyzing Indiana brine samples--has been started. Completion of this part should result in a rather detailed publication on Indiana brines.

ANALYTICAL DATA

Analytical data are classified on a stratigraphic basis (see fig. 1) and are presented in tables 1 to 20. Locations of datum points (wells or leases from which the analyzed samples were obtained) and total solids content in parts per million of the sampled brines are shown in figures 2 to 13. Locations of samples for Pennsylvanian brines are not plotted because the sampled reservoirs ranged through a wide stratigraphic interval, and because plotting the analyses on a map might lead to erroneous interpretation of lateral variations on the character of the brines. Maps for the Salem and lower reservoirs are not included owing to limited areal coverage of information or relative lack of importance as an oil-producing reservoir.

Several points concerning the tables are here amplified to avoid confusion by the reader. Because from the collected data it was impossible to differentiate the Bethel and Paint Creek brines, they are listed together in table 10. Blank spaces in the tables show that the values were not indicated on the analysis records as received by the Indiana Geological Survey and do not indicate the absence of the particular ion in the brines. The determinations of ammonium, nitrate, iodide, and bromide and of some other ions were rarely available; these results were not included in the tables.

The column headings in the tables are self-explanatory, except, perhaps, for the following:

SP. GR.	specific gravity (No single temperature of measurement is assumed.)
NA	sodium
K	potassium
TOTAL FE	total iron
SOL. FE	soluble or dissolved iron
CA	calcium
MG	magnesium
C L	chloride
HCO3	bicarbonate

CO3	carbonate
SO4	sulfate
EQUIV. * NACL (See below.)	equivalent sodium chloride
RES. * 100 F.	resistivity in ohm-meters at 100° F. (See below.)
SD*	source of data (Symbols identified on page 57.)

The EQUIV. * NACL column contains calculated sodium chloride equivalents. Depending upon the available data, the result given was obtained as follows:

(1) Only total solids determination available:

The result for total solids was rounded to three significant figures and listed as equivalent sodium chloride.

(2) Only total solids (calculated) and chloride determinations available:

The total solids content was checked by multiplication of the chloride by 1. 65; the product was rounded to three significant figures and entered as equivalent sodium chloride.

(3) Only total solids and chloride determinations available:

The result for total solids determination was rounded to three significant figures and entered as sodium chloride equivalent.

(4) Chloride and one or more of the following determinations were available: sodium (determined or calculated), potassium, calcium, magnesium, bicarbonate, carbonate, sulfate (and in one case, iodide):

A summation was carried out with use of factors suggested by Dunlap and Hawthorne (1951), which are as follows:

sodium	1.0	chloride	1.0
calcium	0.95	bicarbonate	0.27
magnesium	2.0	carbonate	1.26
		sulfate	0.5;

a factor of 1.0 was assumed for potassium and iodide.

The resistivity in ohm-meters at 100° F. was estimated as follows: From data in the International Critical Tables (1929, v. 6, p. 231, 233, 239) on the specific conductance of sodium chloride solutions at various temperatures and concentrations, curves were

drawn relating temperature and resistivity. From these curves, resistivities at 100° F. were obtained and were in turn plotted versus concentration, in parts per million, recalculated by use of the molecular weight of sodium chloride and a formula relating parts per million to milligrams per liter (ppm = $\frac{\text{Mg/ L x } 10^6}{10 + \text{Mg/ L}}$. Guyod, 1945, p. 74). This final curve was compared with data from a curve for 100° F. in Diagram 3, page 160, of Wyllie's book (Wyllie, 1957). Because of the correspondence of the two curves over the entire range of the prepared curve, the prepared curve was extended for the concentration range 150,000 to 250,000 ppm on the basis of Wyllie's curve. The prepared curve then was used to estimate resistivities for each calculated sodium chloride equivalent. The reader should remember that the resistivities are estimated and may not be correct, especially for those brines for which sulfate is relatively high (Dunlap and Hawthorne, 1951).

Three resistivities measured at 100° F. are included in the tables and are so noted.

No conclusions are drawn concerning the analytical data that are included in tables 1 to 20. Scarcity of information and the probable presence of erroneous analyses and of analyses of contaminated waters make such conclusions undesirable at this time. In the planned detailed report certain conclusions can and will be made.

System	Series	Formation or Group	Lithologies of Formation or Group*	Lithologies of Oil-Reservoir Beds*
Pennsylvanian	Conemaugh	undifferentiated	sh., ss., ls., coal	
	Allegheny	undifferentiated	sh., ss., ls., coal	
	Pottsville	undifferentiated	sh., ss., thin coal	ss.
Mississippian	Chester	Kincaid	ls., sh.	
		Degonia	ss., sh.	ss.
		Clore	ls., ss., sh.	ss.
		Palestine	ss., sh.	ss.
		Menard	ls., sh.	
		Waltersburg	ss., sh.	ss.
		Vienna	ls., sh.	
		Tar Springs	ss., sh.	ss.
		Glen Dean	ls., sh.	
		Hardinsburg	ss., sh.	ss.
		Golconda	ls., sh.	
		Jackson (Big Clifty)	ss., sh.	ss.
		Barlow (Beech Creek)	ls.	
		Cypress (Elwren)	ss., sh.	ss.
		Paint Creek	ls., ss., sh.	ss.
		Bethel	ss., sh.	ss.
		Renault	ls., ss., sh.	ls., ss.
		Aux Vases	ls., dolo., sh., ss.	ls., dolo., ss.
	Meramec	Ste. Genevieve	ls., sh., ss.	ls., ss.
		St. Louis	ls., sh.	ls.
		Salem	ls.	ls.
		Harrodsburg	ls., sh.	ls.
	Osage	Borden Group-fms. undifferentiated	slt., sh., ls., ss.	ss.
	Kinderhook	Rockford	ls.	
		New Albany	sh.	
Devonian	undifferentiated	undifferentiated	ls., dolo.	ls., dolo.
Silurian	undifferentiated	undifferentiated	ls., dolo., sh.	
Ordovician	Cincinnatian	undifferentiated	sh., ls.	
	Mohawkian	Trenton	ls., dolo.	ls., dolo.
		Black River	ls., dolo.	ls., dolo.
	Chazyan	Joachim	dolo.	
	Canadian	St. Peter	ss.	
		Knox	dolo.	
Cambrian	St. Croixan	Eau Claire	slt., sh., ss., dolo.	
		Mt. Simon	ss.	
Precambrian				

*dolo. - dolomite
ls. - limestone
ss. - sandstone
sh. - shale
slt. - silt

Figure 1. --Chart showing Indiana stratigraphic sequence and lithology of oil-reservoir beds.

TABLE 1. ANALYSES IN PPM OF PENNSYLVANIAN BRINES

LOCATION			DEPTH IN FEET	SP. GR.	PH	TOTAL SOLIDS	NA	K	TOTAL FE	SQL. FE	CA	MG	CL	MCO3	CO3	SO4	EQUIV.* NACL	RES.* 100 F.	SD*
INDIANA																			
DAVIESS COUNTY																			
SEC.	T.	R.																	
3	2N	7W	800			28,790?	9,527	55			444	388	11,650	193		6,625	25,800	0.18	A
PIKE COUNTY																			
SEC.	T.	R.																	
34	1N	9W			6.8	38,665?	12,300?		22		1,150	540	21,100	420	0	1,740	36,600	0.13	H
S16#	1N	9W	1,000	1.026	6.1	37,555?	12,876?		22		1,467	346	19,077	167	0	3,622	35,900	0.14	H
# S INDICATES SURVEY																			
POSEY COUNTY																			
SEC.	T.	R.																	
31	3S	13W	1,605-1,620			32,148?											32,100	0.15	H
5	6S	12W	713---717			16,239?	5,997?				95	56	8,863	1,228			15,400	0.30	H
7	6S	12W	1,126	1.019		24,915?	9,390?				112	43	13,980	1,390			23,900	0.20	H
7	6S	12W	1,182	1.018		25,193?	9,500?				57	66	14,150	1,398		22	24,200	0.19	H
7	6S	12W	1,144-1,164	1.018		25,323?	9,568?				43	72	14,200	1,440			24,300	0.19	H
30	6S	12W	1,141	1.030		39,041?	14,485?				77	359	22,674	1,446			38,300	0.13	H
30	6S	12W			7.1	46,612?	16,000?		7.0		1,350	185	25,600	179	0	2,658	44,700	0.11	H
30	6S	12W			7.0	37,819?	12,600?		7.5		1,375	165	20,270	163	0	2,670	35,900	0.14	H
1	6S	13W			7.3	35,220?	13,300?		49		253	238	21,000	626	0	453	35,400	0.14	H
1	6S	13W	1,460		7.9	40,630?	13,900?		14		1,160	255	21,350	213	0	3,775	38,800	0.13	H
17	6S	13W	1,310-1,323			23,900?							14,250				23,500	0.20	H
25	6S	13W	1,177	1.023		28,639?	7,353?				738	1,826	16,063	326		2,360	29.000	0.16	H
36	6S	14W		1.019		21,454?	7,999?				31	36	10,978	1,690		720	19,900	0.23	H
36	6S	14W		1.019	6.2	21,496?	7,999?			0.5	31	36	10,978	1,690		720	19,900	0.23	H
12	6S	14W		1.023		29,664?	10,316?				387	255	14,009	897		3,800	27,300	0.17	H
SPENCER COUNTY																			
SEC.	T.	R.																	
29	7S	6W	165			1,265?	354?				16	4	81	717	39	54	728	5.5	H
30	7S	6W	650---680	1.006		7,299?	2,634?				44	20	3,565	927	18	91	6,600	0.66	H
15	7S	7W	673---695			10,300?							6,250				10,300	0.43	H
VANDERBURGH																			
SEC.	T.	R.																	
30	5S	11W			7.1	46,898?	15,700?		8		1,392	388	25,000	218	0	3,650	44,700	0.11	H
WARRICK COUNTY																			
SEC.	T.	R.																	
9	6S	7W	715---787			14,940?	5,520?				86	2	7,130	522		1,680	13,700	0.33	H

?CALCULATED RESULT, OTHERWISE DETERMINED. EQUIV.* NACL AND REC.* 100 F., SEE TEXT PAGES 9 AND 10, SD* SEE LIST OF SOURCES OF DATA, PAGE 57

TABLE 1. ANALYSES IN PPM OF PENNSYLVANIAN BRINES. CONTINUED

LOCATION			DEPTH IN FEET	SP. GR.	PH	TOTAL SOLIDS	NA	K	TOTAL FE	SQL. FE	CA	MG	CL	MCO3	CO3	SO4	EQUIV.* NACL	RES.* 100 F.	SD*
ILLINOIS																			
CRAWFORD COUNTY																			
SEC.	T.	R.																	
10	5N	11W			8.3	21,660?	8,550?		1.4		130	105	13,600	106	54	8	22,600	0.21	H
15	5N	12W	985			15,260	5,673?			6.0	5	53	7,096	608	360	1,414	14,200	0.32	F
2	5N	13W	898			18,495	7,086?			0.6	59	87	10,354	1,603		0	18,100	0.26	F
2	5N	13W	838			18,782	7,023?			6.0	174	94	10,372	1,839		0	18,200	0.25	F
31	6N	11W	900			14,011	4,572?			1.8	246	212	6,153	322		2,390	12,700	0.36	F
31	6N	11W	900			14,034	4,505?			1.6	340	220	6.200	458		2,346	12,800	0.35	F
28	6N	13W	890			34,525?	12,465?		66		217	281	19,397	1,996	0	0	33,200	0.14	H
28	6N	13W	900	1.015	7.2	22,627?	8,271?				100	149	12,429	1,626	0	12	21,500	0.22	H
10	7N	13W	940---980		6.5	41,306	14,553?			192	562	283	24,106	291		0	39,800	0.12	F
10	7N	13W	1,123-1,197		7.1	19,443?	6,820?		19		440	110	10,400	383	0	1,350	18,600	0.25	H
10	7N	13W	1,182-1,244		7.1	19,653?	6,900?		18		470	95	10,500	371	0	1,392	18,800	0.25	H
EDWARDS COUNTY																			
SEC.	T.	R.																	
36	2S	10E	2,059-2,070			59,495?	21,395?		24		901	593	35,992	562	0	28	59,600	0.085	H
1	3S	10E	1,496-1,514			29,241?											29,200	0.16	H
1	3S	10E	1,649-1,659			38,013?											38,000	0.13	H
1	3S	10E	1,515-1,544			21,888?											21,900	0.21	H
1	3S	10E	1,896-1,192			45,290?											45,300	0.11	H
1	3S	10E	2,063-2,095			47,640?											47,600	0.10	H
1	3S	10E	1,687-1,721			35,602?											35,600	0.14	H
12	3S	10E	1,954-1,982			46,632?	17,281?				331	276	26,595	936	0	1,213	45,600	0.11	H
12	3S	10E	1,875-1,878			44,460?											44,500	0.11	H
12	3S	10E	1,826-1,844			45,890?											45,900	0.11	H
12	3S	10E	1,859-1,865			44,572?	16.697?		8		337	236	26,666	590	0	38	44,300	0.11	H
12	3S	10E	1,968-1,998			52,137?	19,432?				477	309	31,382	470	0	67	52,000	0.096	H
13	3S	10E	1,974-1,983		6.5	54,070	19,64.3?		2.8	0.4	648	431	32,349	600		57	53,700	0.093	F
GALLATIN COUNTY																			
SEC.	T.	R.																	
15	8S	10E	1,200			28,194			305		308	204	15,753				28,200	0.17	F
15	8S	10E			7.3	39,213?	10,700		5.2		268	204	16,200	571	0	1,400	28,400	0.17	H
16	8S	10E			7.4	39,284?	10,800						16,000	712	0	1,700	28,500	0.17	H
LAWRENCE COUNTY																			
SEC.	T.	R.																	
8	2N	12W	1,508-1,531		6.8	32,290	11,101		50	0.6	612	229	17,383	526		2,258	30,800	0.16	F
5	3N	12W			7.5	14,766?	5,900				100	64	8,864	933	0	77	15,300	0.30	H
5	3N	12W		1.025	6.8	19,092?	6,767		108		136	105	9,250	665	0	2,015	17,500	0.26	H
5	3N	12W	1,100		7.0	20,300?	9,970				105	14	14,800	1,000	0	287	25,300	0.19	H

?CALCULATED RESULT, OTHERWISE DETERMINED. EQUIV.* NACL AND REC.* 100 F., SEE TEXT PAGES 9 AND 10, SD* SEE LIST OF SOURCES OF DATA, PAGE 57

TABLE 1. ANALYSES IN PPM OF PENNSYLVANIAN BRINES, CONTINUED

LOCATION			DEPTH IN FEET	SP. GR.	PH	TOTAL SOLIDS	NA	K	TOTAL FE	SOL. FE	CA	MG	CL	MCO3	CO3	SO4	EQUIV.* NACL	RES.* 100 F.	SD*
ILLINOIS, CONTINUED																			
LAWRENCE COUNTY, CONTINUED																			
SEC.	T.	R.																	
6	3N	12W			8.2	14,670?	6,030?				51	67	8,155	1,122	78	921	15,200	0.30	H
7	3N	12W			8.0	14,882?	6,180?				171	80	8,400	1,104	54	1,305	15,900	0.29	H
7	3N	12W			8.0	15,916?	6,100?				106	85	8,150	830	48	1,561	15,600	0.29	H
35	3N	12W			7.5	18,600?	7,740?		0		64	96	11,276	1,269	0	430	19,800	0.23	H
35	3N	12W			7.2	22,490?	8,910?		0		124	68	12,588	2,489	0	154	24,500	0.19	H
35	3N	12W			7.0	23,184?	7,740?				74	114	11,460	1,610	0	0	19,900	0.23	H
35	3N	12W			7.0	25,118?	9,590?				166	149	13,180	3,934	0	65	24,300	0.19	H
5	4N	12W			7.9	21,516?	9,690?				126	80	15,000	525	0	116	25,200	0.19	H
32	4N	12W			7.7	17,680?	6,790?				221	82	9,300	653	0	1,919	17,600	0.26	H
32	4N	12W	1,100		7.5	19,993?	6,200?			0	160	92	9,600	682	0	144	16,400	0.28	H
32	4N	12W			8.0	18,516?	7,420?				142	109	9,928	595	30	2,303	19,100	0.24	H
32	4N	12W			6.0	17,452?	6,175?				55	10	9,500	91	0	1,622	16,600	0.28	H
33	4N	12W			7.5	43,560?	16,300?				1,000	3	25,750	397	60	1,245	43,900	0.11	H
33	4N	12W			7.5	52,494?	18,900?				1,424	306	30,848	293	0	1,996	52,800	0.095	H
33	4N	12W			6.6	62,614?	21,592?		12.0	0.7	1,680	672	37,200	238	0	1,220	62,400	0.081	H
WABASH COUNTY																			
SEC.	T.	R.																	
22	1N	12W	1,442-1,476			36,367							20,178				36,400	0.13	F
17	1S	12W	2,053-2,072			55,300	19,204?		88	24	1,252	383	31,845		74	1,458	53,800	0.093	F
WHITE COUNTY																			
SEC.	T.	R.																	
22	3S	10E	1,958-1,966		7.1	48,886	17,758?		8.0	1.2	693	277	29,238	320		8	48,300	0.10	F
31	3S	14W			8.1	60,819?	21,600?		1.0		1,080	320	35,050	134	12	1,440	59,100	0.085	H
31	3S	14W			8.5	62,530?	22,900?		0.5		790	245	36,550	88	10	1,090	61,300	0.082	H
6	4S	14W	1,517-1,556		6.4	28,890	9,540?		30	4.0	951	245	16,048	164		1,397	27,700	0.17	F
27	4S	14W	733---747			14,514											14,500	0.32	F
32	5S	10E	2,086-2,103	1.043	7.5	67,500?	20,600?	35			1,500	728	38,200	228		1,600	62,600	0.081	H
5	6S	10E	2,169	1.046	7.0	70,600?	22,200?	40	19		1,540	749	39,500	248		1,320	65,400	0.078	H
5	6S	10E	1,339-1,351	1.026	7.4	42,800?	12,900?	36			553	164	22,400	378			36,300	0.13	H
KENTUCKY																			
DAVIES COUNTY																			
CARTER COORDINATES																			
13	P	27	300	1.009		17,359?	6,350?	64		0.1	87	100	8,675	345		1,738	16,300	0.28	E
HENDERSON COUNTY																			
CARTER COORDINATES																			
23	P	26	470---497			15,822?	5,380?				290	76	6,538	738		2,800	13,900	0.33	H
21	Q	21			7.5	36,144?	12,100?		8.3		1,200	241	18,600	163	0	3,850	34,300	0.14	H

?CALCULATED RESULT, OTHERWISE DETERMINED. EQUIV.* NACL AND REC.* 100 F., SEE TEXT PAGES 9 AND 10, SD* SEE LIST OF SOURCES OF DATA, PAGE 57

TABLE 1. ANALYSES IN PPM OF PENNSYLVANIAN BRINES, CONTINUED

LOCATION	DEPTH IN FEET	SP. GR.	PH	TOTAL SOLIDS	NA	K	TOTAL FE	SOL. FE	CA	MG	CL	MCO3	CO3	SO4	EQUIV.* NACL	RES.* 100 F.	SD*
KENTUCY CONTINUED																	
UNION COUNTY																	
CARTER COORDINATES																	
16 0 20	1,184-1,215	1.021		25,542?	9,775?				134	169	15,266	198			25,600	0.18	E
16 0 20	1,185-1,211	1.022		26,115?	9,767?				132	138	15,160	918			25,600	0.18	H
16 0 20	1,390-1,450	1.027		33,282?	10,978?				1,238	206	16,562	98		4,200	31,300	0.15	H
16 0 20	1,185-1,207	1.023		27,254?	10,287?				84	140	15,960	775		8	26,800	0.18	H

?CALCULATED RESULT, OTHERWISE DETERMINED. EQUIV.* NACL AND REC.* 100 F., SEE TEXT PAGES 9 AND 10, SD* SEE LIST OF SOURCES OF DATA, PAGE 57

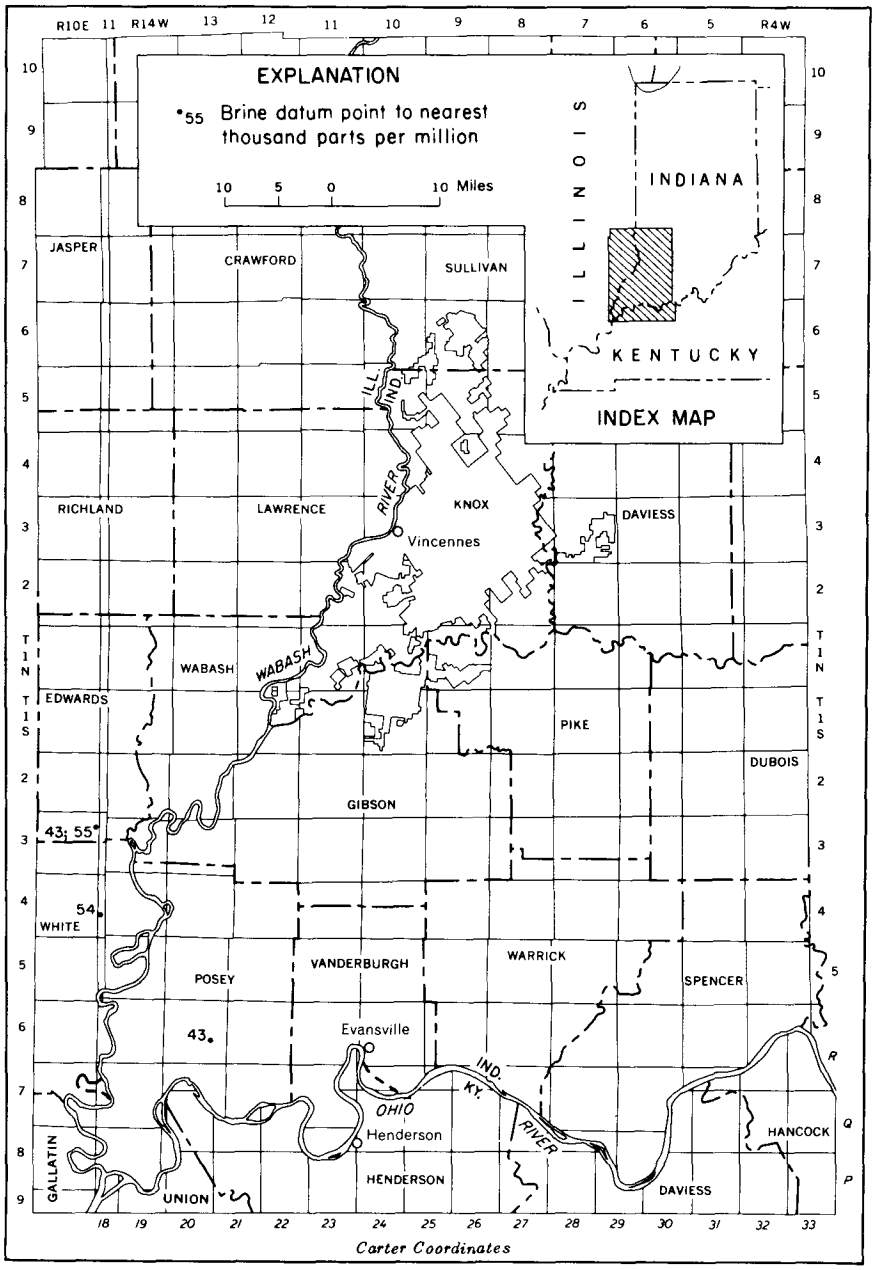

Figure 2. --Map showing total solids in Degonia brines.

TABLE 2 ANALYSES IN PPM OF DEGONIA BRINES

LOCATION			DEPTH IN FEET	SP. GR.	PH	TOTAL SOLIDS	NA	K	TOTAL FE	SOL. FE	CA	MG	CL	MCO3	CO3	SO4	EQUIV.* NACL	RES.* 100 F.	SD*
INDIANA																			
POSEY COUNTY																			
SEC.	T.	R.																	
23	6S	13W	1,631-1,641	1.030		42,614?	14,182?				1,280	325	20,240	137		6,450	39,600	0.12	H
ILLINOIS																			
EDWARDS COUNTY																			
SEC.	T.	R.																	
12	3S	10E	2,128-2,132			55,040?											55,000	0.091	H
12	3S	10E	2,097-2,106			43,000?											43,000	0.11	H
WHITE COUNTY																			
SEC.	T.	R.																	
19	4S	11E	1,969-2,020		6.8	54,290	19,630?		7.0	0.6	958	440	32,815	252		419	54,500	0.092	F

?CALCULATED RESULT, OTHERWISE DETERMINED. EQUIV.* NACL AND REC.* 100 F., SEE TEXT PAGES 9 AND 10, SD* SEE LIST OF SOURCES OF DATA, PAGE 57

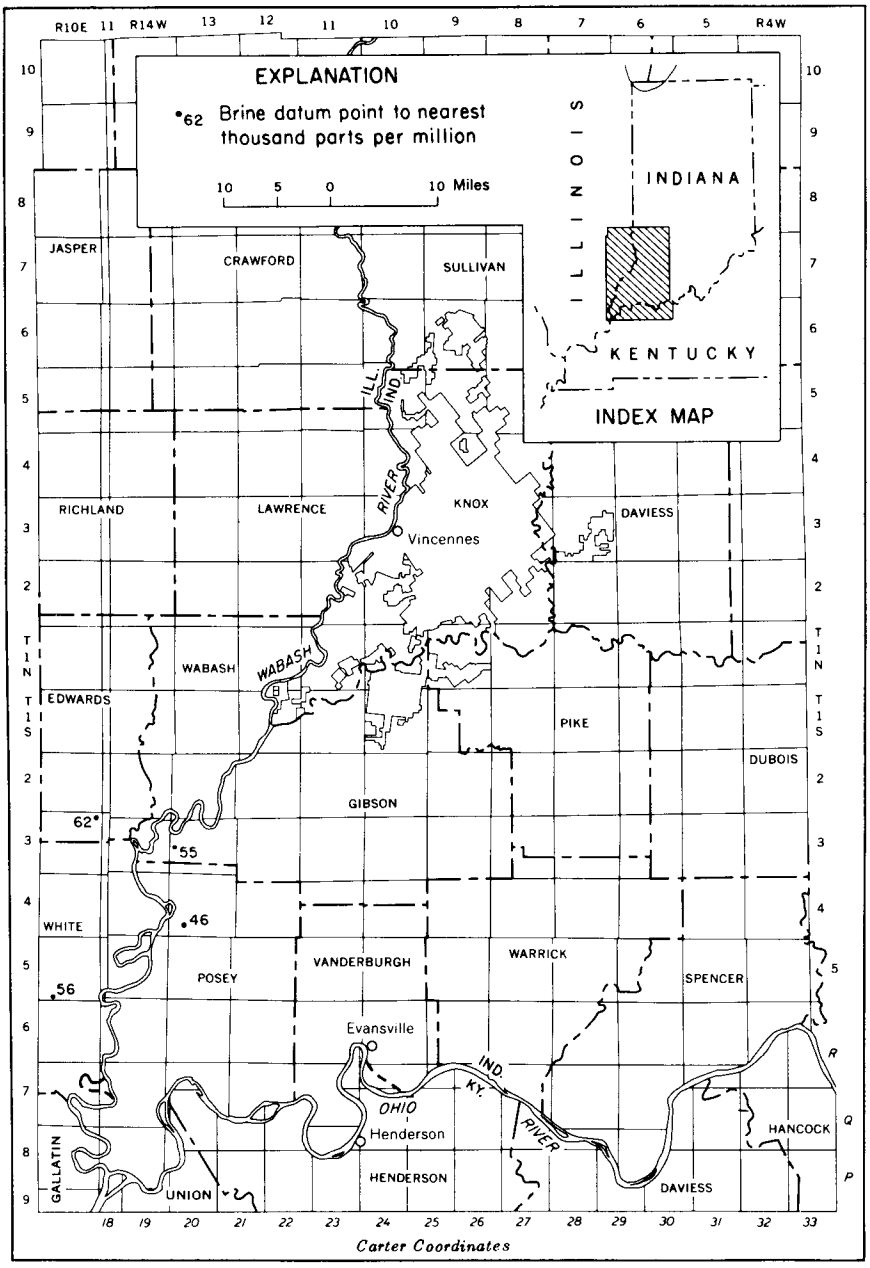

Figure 3. --Map showing total solids in Clore brines.

TABLE 3. ANALYSES IN PPM OF CLORE BRINES

LOCATION			DEPTH IN FEET	SP. GR.	PH	TOTAL SOLIDS	NA	K	TOTAL FE	SOL. FE	CA	MG	CL	MCO3	CO3	SO4	EQUIV.* NACL	RES.* 100 F.	SD*
INDIANA																			
GIBSON COUNTY																			
SEC.	T.	R.																	
18	3S	13W	1,836-1,849	1.037	6.2	55,200?	18,000?	70	4		1,000	230	29,600	195		3,300	50,800	0.098	H
POSEY COUNT																			
SEC.	T.	R.																	
29	4S	13W	1,885-1,890			46,270?											45,300	0.11	H
ILLINOIS																			
EDWARDS COUNTY																			
SEC.	T.	R.																	
1	3S	10E	2,130-2,141			61,760?											61,800	0.082	H
WHITE CONTY																			
SEC.	T.	R.																	
32	5S	10E	2,086-2,098	1.037	7.2	55,740?	17,500?	55	370		409	492	31,893	161		226	51,000	0.098	H

?CALCULATED RESULT, OTHERWISE DETERMINED. EQUIV.* NACL AND REC.* 100 F., SEE TEXT PAGES 9 AND 10, SD* SEE LIST OF SOURCES OF DATA, PAGE 57

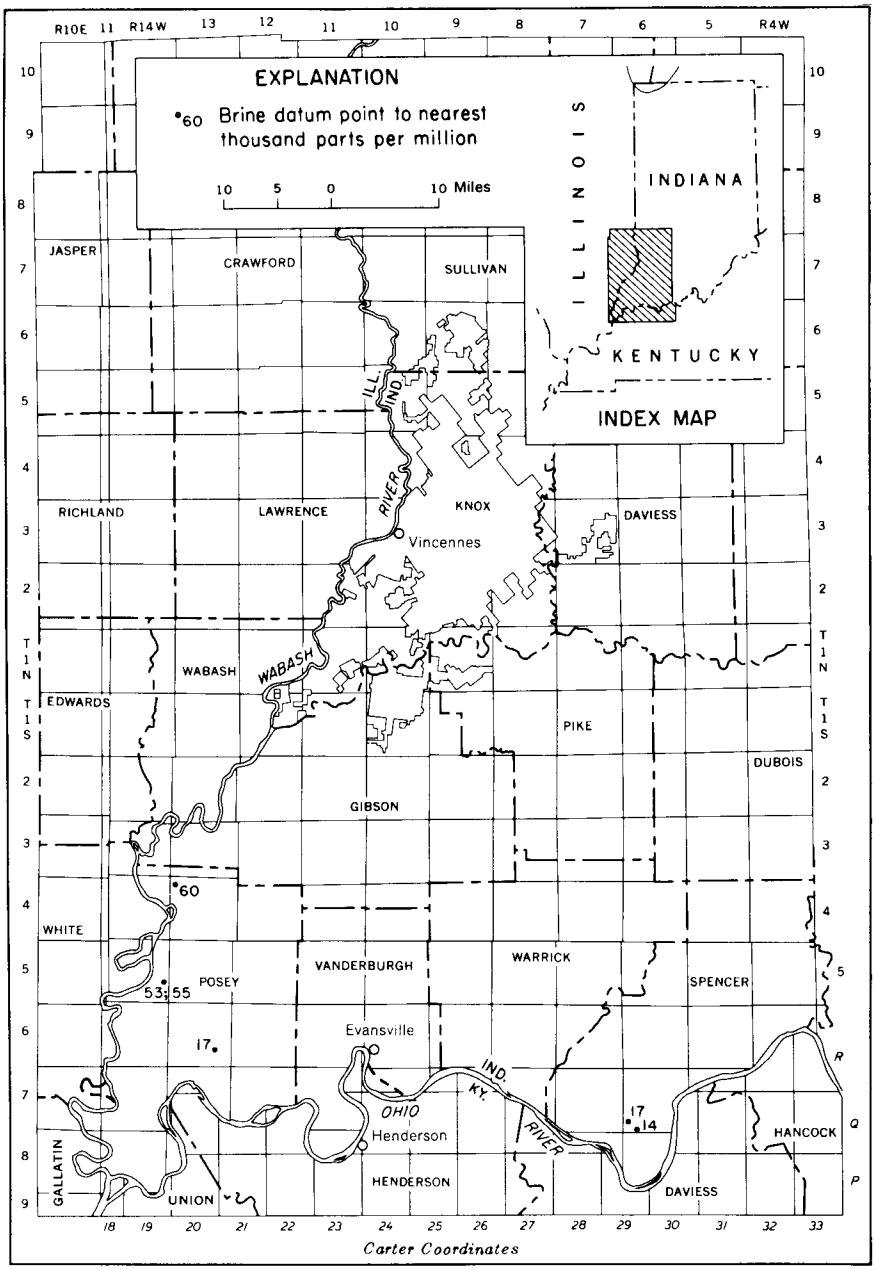

Figure 4. --Map showing total solids in Palestine brines.

TABLE 4 ANALYSES IN PPM OF PALESTINE BRINES

LOCATION			DEPTH IN FEET	SP. GR.	PH	TOTAL SOLIDS	NA	K	TOTAL FE	SOL. FE	CA	MG	CL	MCO3	CO3	SO4	EQUIV.* NACL	RES.* 100 F.	SD*
INDIANA																			
POSEY COUNTY																			
SEC.	T.	R.																	
6	4S	13W	1,898-1,906	1.046		60,479?	21,650?				1,110	570	36.900	232		17	60,800	0.083	H
24	5S	14W				53,000?							32,000				53,000	0.094	H
24	5S	14W	1,974-1,976			54,710?											54,700	0.092	H
23	6S	13W	1,802-1,815	1.012		16,727?	5,485?				566	56	6,831	43	6	3,740	14,900	0.30	H
30	7S	6W	891---904	1.016		16,902?	6,240?				178	90	9,870	342		182	16,600	0.28	H
SPENCER COUNTY																			
SEC.	T.	R.																	
32	7S	6W	918---920	1.010		14,354?	5,267?				112	66	6,730	259		1,920	13,300	0.34	H

?CALCULATED RESULT, OTHERWISE DETERMINED. EQUIV.* NACL AND REC.* 100 F., SEE TEXT PAGES 9 AND 10, SD* SEE LIST OF SOURCES OF DATA, PAGE 57

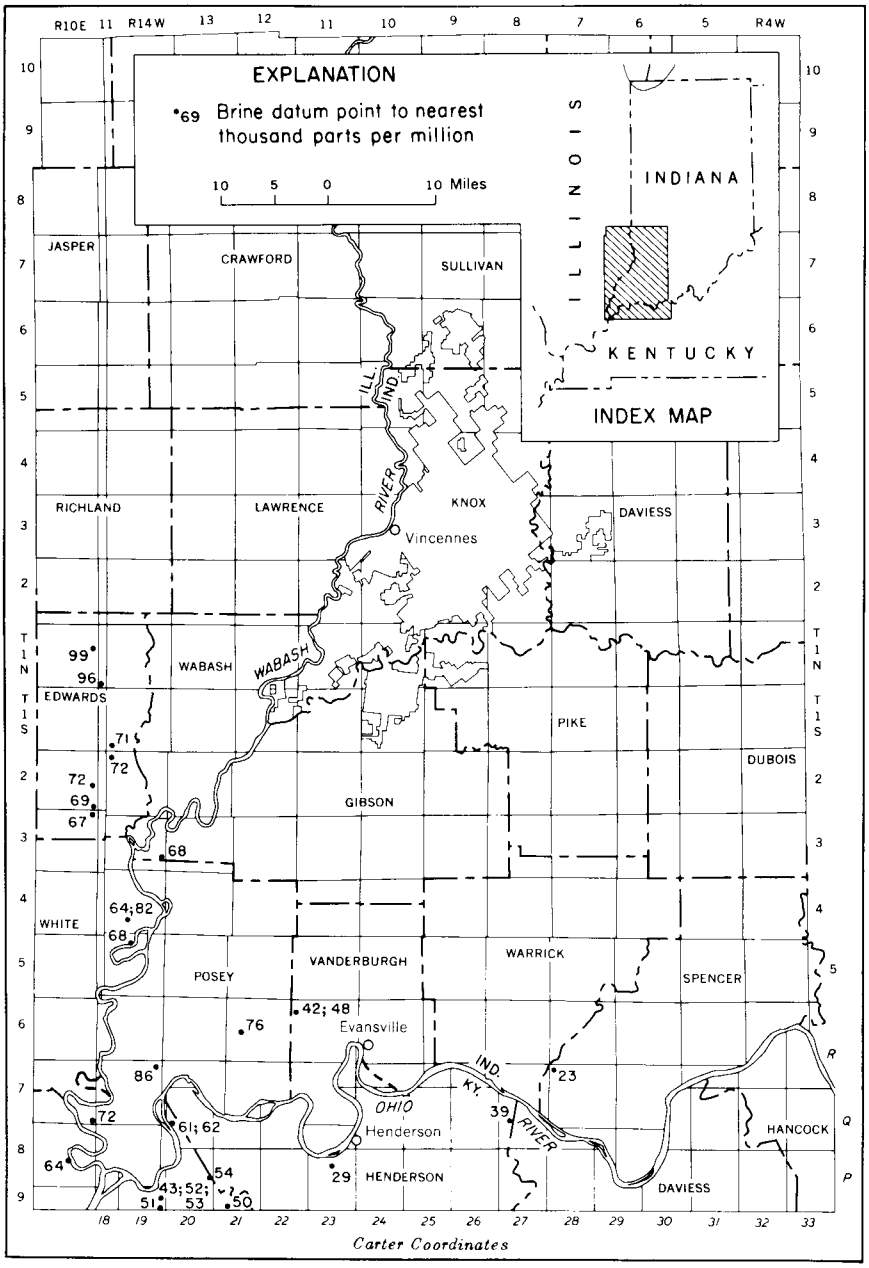

Figure 5. --Map showing total solids in Waltersburg brines.

TABLE 5. ANALYSES IN PPM OF WALTERSBURG BRINES

LOCATION			DEPTH IN FEET	SP. GR.	PH	TOTAL SOLIDS	NA	K	TOTAL FE	SOL. FE	CA	MG	CL	MCO3	CO3	SO4	EQUIV.* NACL	RES.* 100 F.	SD*
INDIANA																			
GIBSON COUNTY																			
SEC.	T.	R.																	
25	3S	14W		1.048	6.1	67,766?	23,899?		0		1,620	513	41,133				67,600	0.076	H
POSEY COUNTY																			
SEC.	T.	R.																	
20	6S	12W	1,850-1,868	1.053		75,737?	26,400?				1,280	605	37,425	577		9,450	71,100	0.072	H
1	7S	14W		1.058		85,679?	31,797?				641	532	49,610	1,143		1,955	84,400	0.062	H
36	7S	15W	2,000	1.048	6.9	72,027?	26,069?		54		1,018	494	41,400	666	0	2,326	70,800	0.072	H
SPENCER COUNTY																			
SEC.	T.	R.																	
6	7S	7W	1,040-1,042	1.019		22,630?	7,417?				582	85	7,650	183	12	6,700	19,200	0.24	H
VANDERBURGH COUNTY																			
SEC.	T.	R.																	
7	6S	11W				42,100?							25,500				42,100	0.12	H
7	6S	11W	1,824-1,831		7.3	47,800	15,600	32	1.9		968	281	26,400	215	0	2,930	45,000	0.012#	C
																	#MEASURED VALUE		
ILLINOIS																			
EDWARDS COUNTY																			
SEC.	T.	R.																	
13	1N	10E	2,448-2,446			99,318											99,300	0.055	F
31	1N	11E	2,433-2,437		5.2	95,946	32,222?		114	96	2,970	1,022	56,734	30		1,619	94,600	0.056	F
31	1S	14W	2,284-2,288			70,940											70,900	0.072	F
24	2S	10E	2,375-2,387			71,840	24,896?		6.40	0.2	1,728	640	43,161	237		55	71,100	0.072	F
36	25	10E	2,391-2,403			69,337?	24,166?		8		1,782	727	42,375	250	0	29	69,800	0.074	H
6	25	14W	2,254-2,261			72,080											72,100	0.071	F
1	35	10E	2,420-2,430			67,080?											67,100	0.076	H
GALLATIN COUNTY																			
SEC.	T.	R.																	
22	8S	10E	1,985-1,994		7.2	64,110	22,655?		40	0.0	1,189	497	38,276	211		123	63,200	0.080	F
WHITE COUNTY																			
SEC.	T.	R.																	
28	4S	14W	2,102-2,135		6.4	81,798	29,274?		100	7.0	1,222	708	49,286	158		48	81,200	0.064	F
28	4S	14W	2,114-2,167			64,160?											64,200	0.079	H
10	5S	14W	2,222-2,224			68,460?											68,500	0.075	H
KENTUCKY																			
HENDERSON COUNTY																			
CARTER COORDINATES																			
8	P	23	1,648-1,652	1.024		29,021?	9,879?				832	244	15,720	226		2,120	28,000	0.17	H
14	Q	27	1,200	1.027	7.1	39,190?	14,310?		31	14	616	229	23,581	339	0	81	39,100	0.12	H

?CALCULATED RESULT, OTHERWISE DETERMINED. EQUIV.* NACL AND REC.* 100 F., SEE TEXT PAGES 9 AND 10, SD* SEE LIST OF SOURCES OF DATA, PAGE 57

TABLE 5. ANALYSES IN PPM OF WALTERSBURG BRINES, CONTINUED

LOCATION			DEPTH IN FEET	SP. GR.	PH	TOTAL SOLIDS	NA	K	TOTAL FE	SOL. FE	CA	MG	CL	MCO3	CO3	SO4	EQUIV.* NACL	RES.* 100 F.	SD*
KENTUCY CONTINUED																			
UNION COUNTY																			
CARTER COORDINATES																			
20	P	19	1,826-1,857	1.039	8.3	52,109?	19,493?				382	302	31,250	558		58	51,900	0.096	H
20	P	19	1,830-1,860	1.033		42,756?	14,174?				1,958	255	25,294	165		910	42,300	0.12	H
20	P	19	1,842-1,864	1.041		53,169?	18,398?				1,498	509	32,010	424		330	53,100	0.094	H
21	P	19	1,810-1,816			51,024?	19,260?				247	273	30,484	744		16	50,700	0.098	H
11	P	20	1,727-1,768	1.040		53,669?	25,192?				378	237	31,910	772		180	53,200	0.094	E
24	9	21	1,710	1.040		50,230?	18,242?				760	402	30,250	182		394	50,300	0.099	H
16	Q	20	1,801-1,822	1.044		61,327?	22,885?				499	380	36,790	548		225	61,200	0.083	H
16	Q	20	1,806-1,822	1.046		62,262?	23,184?				469	428	37,134	537		510	62,000	0.082	H

?CALCULATED RESULT, OTHERWISE DETERMINED. EQUIV.* NACL AND REC.* 100 F., SEE TEXT PAGES 9 AND 10, SD* SEE LIST OF SOURCES OF DATA, PAGE 57

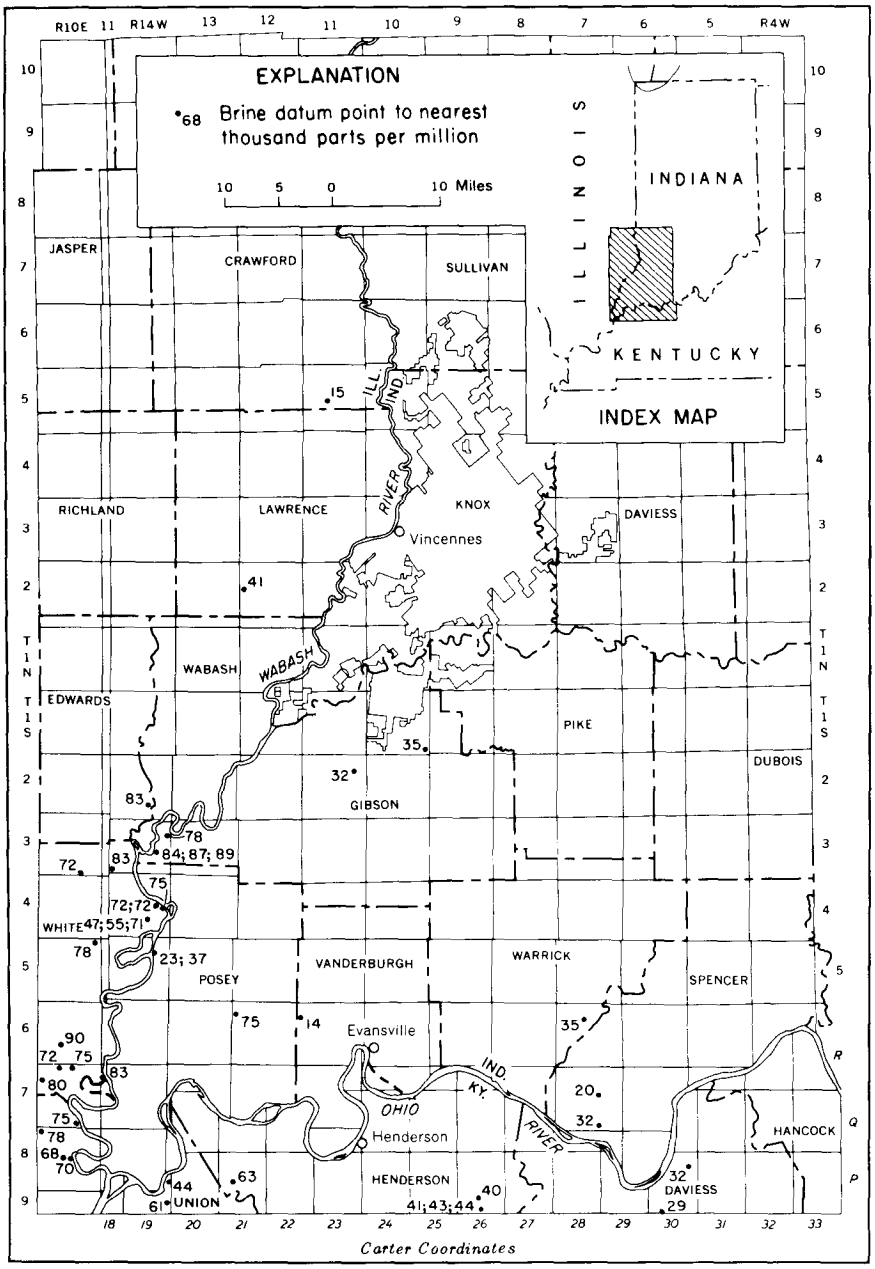

Figure 6. --Map showing total solids in Tar Springs brines.

TABLE 6. ANALYSES IN PPM OF TAR SPRINGS BRINES

LOCATION			DEPTH IN FEET	SP. GR.	PH	TOTAL SOLIDS	NA	K	TOTAL FE	SOL. FE	CA	MG	CL	MCO3	CO3	SO4	EQUIV.* NACL	RES.* 100 F.	SD*
INDIANA																			
GIBSON COUNTY																			
SEC.	T.	R.																	
36	1S	10W		1.027	7.0	35,376?	11,489?		9		1,435	290	18,262	144	0	3,747	33,600	0.14	H
11	2S	11W	1,375			32,293?	10,360?				1,244	338	16,040	311		4,000	30,300	0.15	H
12	3S	14W	2,130-2,144	1.050	7.3	78,204?	24,000?	65	17		1,900	1,209	44,949	222		16	73,300	0.070	H
23	3S	14W		1.056	6.8	84,400?	24,400?	123			664	977	45,400	298		2,100	43,600	0.070	H
23	3S	14W		1.058	7.0	87,300?	29,000?	77	3		2,470	824	45,700	298		4,260	81,000	0.065	H
23	3S	14W		1.057	6.9	88,900?	25,500?	86	4		2,410	824	45,900	321		4,140	77,600	0.067	H
POSEY COUNTY																			
SEC.	T.	R.																	
10	5S	14W	2,239-2,252			22,840?											22,800	0.20	H
10	5S	14W	2,258-2,262			37,480?											37,500	0.13	H
7	6S	12W	2,100		8.1	74,885?	25,600?		19		1,896	576	40,800	193	0	4,900	71,900	0.072	H
SPENCER COUNTY																			
SEC.	T.	R.																	
15	7S	7W	1,049-1,056			19,600?							11,875				19,600	0.24	H
34	7S	7W	1,123-1,132	1.025		31,890?	11,710?				359	213	18,700	378		530	31,500	0.15	H
VANDERBURGH COUNTY																			
SEC.	T.	R.																	
7	6S	11W	1,974-1,981			14,000?							8,500				14,000	0.33	H
WARRICK COUNTY																			
SEC.	T.	R.																	
9	6S	7W	1,110-1,129	1.022		34,630?	12,800?				400	192	20,500	230		500	34,400	0.14	H
ILLINOIS																			
CRAWFORD COUNTY																			
SEC.	T.	R.																	
21	5N	11W	1,234-1,311		7.6	15,328?	6,850?		15		215	106	9,350	429	0	2,240	17,900	0.26	H
EDWARDS COUNTY																			
SEC.	T.	R.																	
27	2S	14W	2,226-2,239		6.7	83,308	27,629?		2.4	2.0	2,652	740	47,107	282		2,978	80,300	0.065	F
GALLATIN COUNTY																			
SEC.	T.	R.																	
34	7S	10E	2,121-2,137		7.3	74,740	26,606?		3.2	0.0	1,128	503	44,353	259		0	73,100	0.071	F
6	8S	10E	2,150-2,160			78,338											78,300	0.067	F
15	8S	10E	2,062-2,080		7.0	70,386	25,696?		2.4	0.4	830	479	42,249	329	21	21	69,800	0.074	F
16	8S	10E	2,060-2,077		7.2	68,300	24,239?				1,087	476	37,687	1,054		3,280	65,800	0.077	F

?CALCULATED RESULT, OTHERWISE DETERMINED. EQUIV.* NACL AND REC.* 100 F., SEE TEXT PAGES 9 AND 10, SD* SEE LIST OF SOURCES OF DATA, PAGE 57

TABLE 6 ANALYSES IN PPM OF TAR SPRINGS BRINES, CONTINUED

LOCATION			DEPTH IN FEET	SP. GR.	PH	TOTAL SOLIDS	NA	K	TOTAL FE	SOL. FE	CA	MG	CL	MCO3	CO3	SO4	EQUIV.* NACL	RES.* 100 F.	SD*
ILLINOIS, CONTINUED																			
LAWRENCE COUNTY																			
SEC.	T.	R.																	
18	2N	12W	1,603-1,612			41,414											41,400	0.12	F
WHITE COUNTY																			
SEC.	T.	R.																	
34	3S	10E	2,450	1.053	6.7	72,335?	24,547?		27		2,317	623	41,045	212	0	3,564	70,900	0.073	H
31	3S	14W	1,136	1.058	6.5	82,934?	28,934?		35		1,700	991	46,807			4,555	81,600	0.065	H
14	4S	14W	2,230-2,243		6.4	71,612	24,928?		10	1.0	1,584	677	43,043	347		10	70,900	0.073	F
14	4S	14W	2,235-2,241			72,240?											72,200	0.072	H
23	4S	14W	2,236-2,266			75,300?											75,300	0.069	H
27	4S	14W	2,191-2,203			55,300?											55,300	0.090	H
27	4S	14W	2,232-2,241			70,610?											70,600	0.073	H
27	4S	14W	2,237-2,259			47,470?											47,500	0.10	H
1	5S	10E	2,288-2,329		6.8	78,500	27,475?		0.6	0.0	1,610	751	44,329	411		3,840	76,900	0.068	F
28	6S	10E	2,267-2,290			89,756	31,240?		40	0.4	1,988	772	51,905	242		2,600	87,900	0.060	F
3	7S	10E	2,100	1.050	7.2	75,000?	26,586?		19		1,609	472	44,768	257	0	1,018	74,700	0.070	H
4	7S	10E	2,600	1.050	7.3	72,328?	26,201?		13		1,290	516	44,059	231	0	12	72,600	0.071	H
7	7S	10E	2,411		6.7	79,954	26,906?		18	8.0	2,197	601	46,587	139		768	77,200	0.067	F
7	7S	11E	2,109-2,126			83,418	30,365?		0.4	0.0	958	614	49,663	536		472	82,500	0.064	F
KENTUCY																			
DAVIESS COUNTY																			
CARTER COORDINATES																			
9	P	30	961---969	1.021		31,744?	11,390?				412	205	16,590	247		2,900	30,300	0.16	H
24	P	30	1,078-1,117			29,468?	10,590?				441	188	16,200	189		1,860	28,600	0.17	H
HENDERSON COUNTY																			
CARTER COORDINATES																			
14	P	21			8.0	62,618?	23,800?			0.8	1,200	560	37,950	483	0	3,100	65,700	0.078	H
18	P	26	1,503-1,508	1.029		40,186?	14,477?				748	315	24,400	122		124	40,300	0.12	H
23	P	26	1,450-1,460	1.030		41,406?	14,887?				803	289	24,750	192		485	41,300	0.12	H
23	P	26	1,505-1,508	1.030		42,942?	15,500?				832	283	26,050	226		51	43,000	0.11	H
23	P	26	1,521-1,534	1.03		43,509?	15,470?				1,140	0	26,625	26		248	43,300	0.11	E
UNION COUNTY																			
CARTER COORDINATES																			
11	P	19	1,843-1,849	1.034		43,891?	15,838?				538	321	24,148	566		2,480	42,500	0.12	H
20	P	19	1,874-1,865	1.048		60,948?	21,876?				759	502	33,270	541		4,000	59,000	0.085	H

?CALCULATED RESULT, OTHERWISE DETERMINED. EQUIV.* NACL AND REC.* 100 F., SEE TEXT PAGES 9 AND 10, SD* SEE LIST OF SOURCES OF DATA, PAGE 57

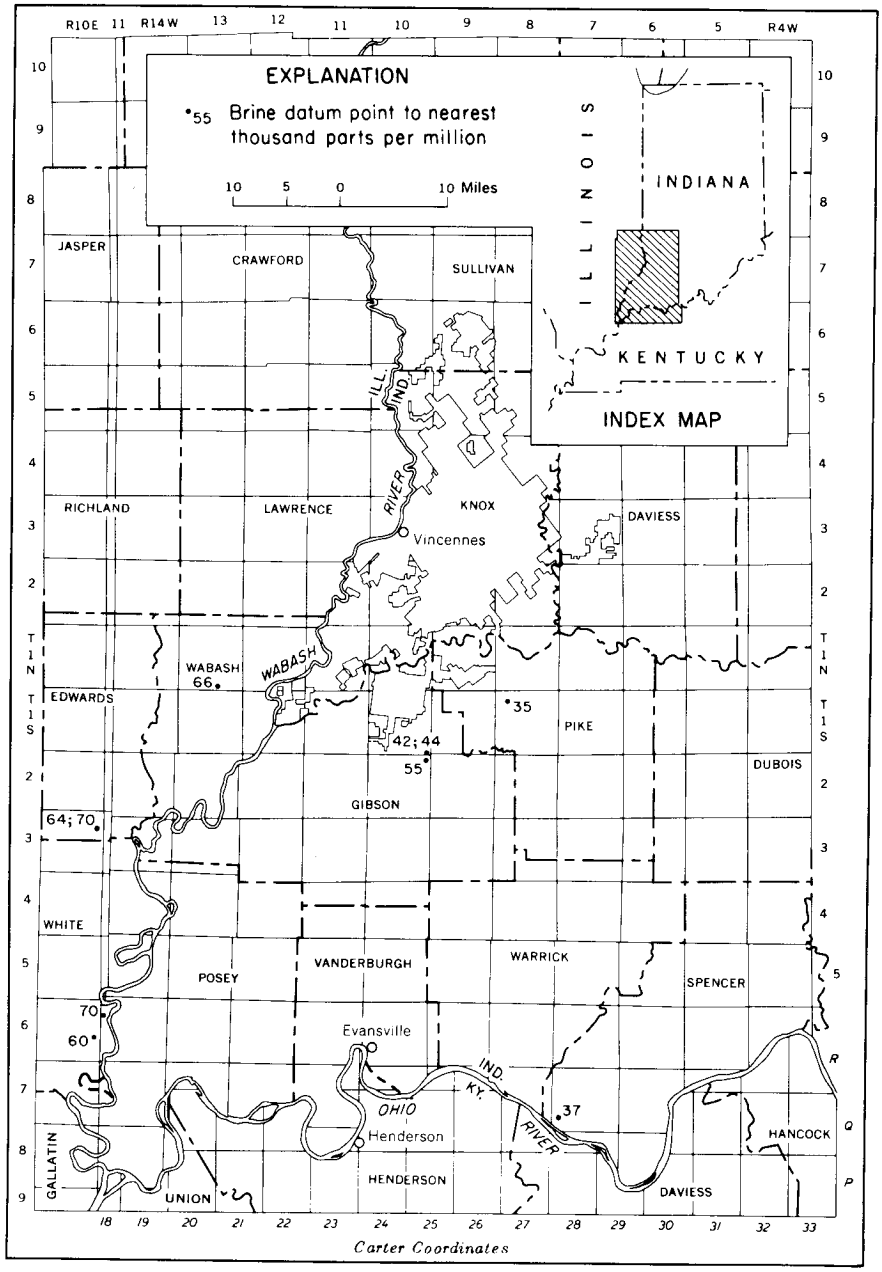

Figure 7. --Map showing total solids in Hardinsburg brines.

TABLE 7. ANALYSES IN PPM OF HARDINSBURG BRINES

LOCATION			DEPTH IN FEET	SP. GR.	PH	TOTAL SOLIDS	NA	K	TOTAL FE	SOL. FE	CA	MG	CL	MCO3	CO3	SO4	EQUIV.* NACL	RES.* 100 F.	SD*
INDIANA																			
GIBSON COUNTY																			
SEC.	T.	R.																	
36	1S	10W		1.033	6.8	44,158?	14,735?		5		1,417	449	23,829	217		3,506	42,600	0.11	H
36	1S	10W		1.033	7.0	42,464?	14,156?		428		1,004	406	22,233	183		4,054	40,200	0.12	H
1	2S	10W		1.040	6.6	55,109?	18,560?		25		1,609	642	30,957	232		3,084	53,900	0.093	H
PIKE COUNTY																			
SEC.	T.	R.																	
8	1S	8W	1,146-1,170	1.028		34,735?	12,400?				400	375	19,500	360		1,700	34,000	0.14	H
SPENCER COUNTY																			
SEC.	T.	R.																	
30	7S	7W	1,190	1.028		36,918?	13,367?				586	308	22,292	409		19	37,000	0.13	H
ILLINOIS																			
EDWARDS COUNTY																			
SEC.	T.	R.																	
12	3S	10E	2,623-2,638			63,845?	23,003?				1,723	522	35,549	300	0	3,757	62,200	0.082	H
12	3S	10E	2,659-2,664			70,300?											70,300	0.073	H
WABASH COUNTY																			
SEC.	T.	R.																	
34	1N	13W	1,779-1,800		6.6	66,420	22,187?		30	10	2,174	704	37,102	215		3,973	64,800	0.079	F
WHITE COUNTY																			
SEC.	T.	R.																	
24	6S	10E	2,000-2,016		7.8	59,896	21,134?		0.0	0.0	1,231	500	35,725	107	19	690	59,400	0.085	F
7	6S	11E	2,012-2,018			70,430	24,297?		11	2.4	1,773	601	40,788	217		1,971	69,000	0.074	F

?CALCULATED RESULT, OTHERWISE DETERMINED. EQUIV.* NACL AND REC.* 100 F., SEE TEXT PAGES 9 AND 10, SD* SEE LIST OF SOURCES OF DATA, PAGE 57

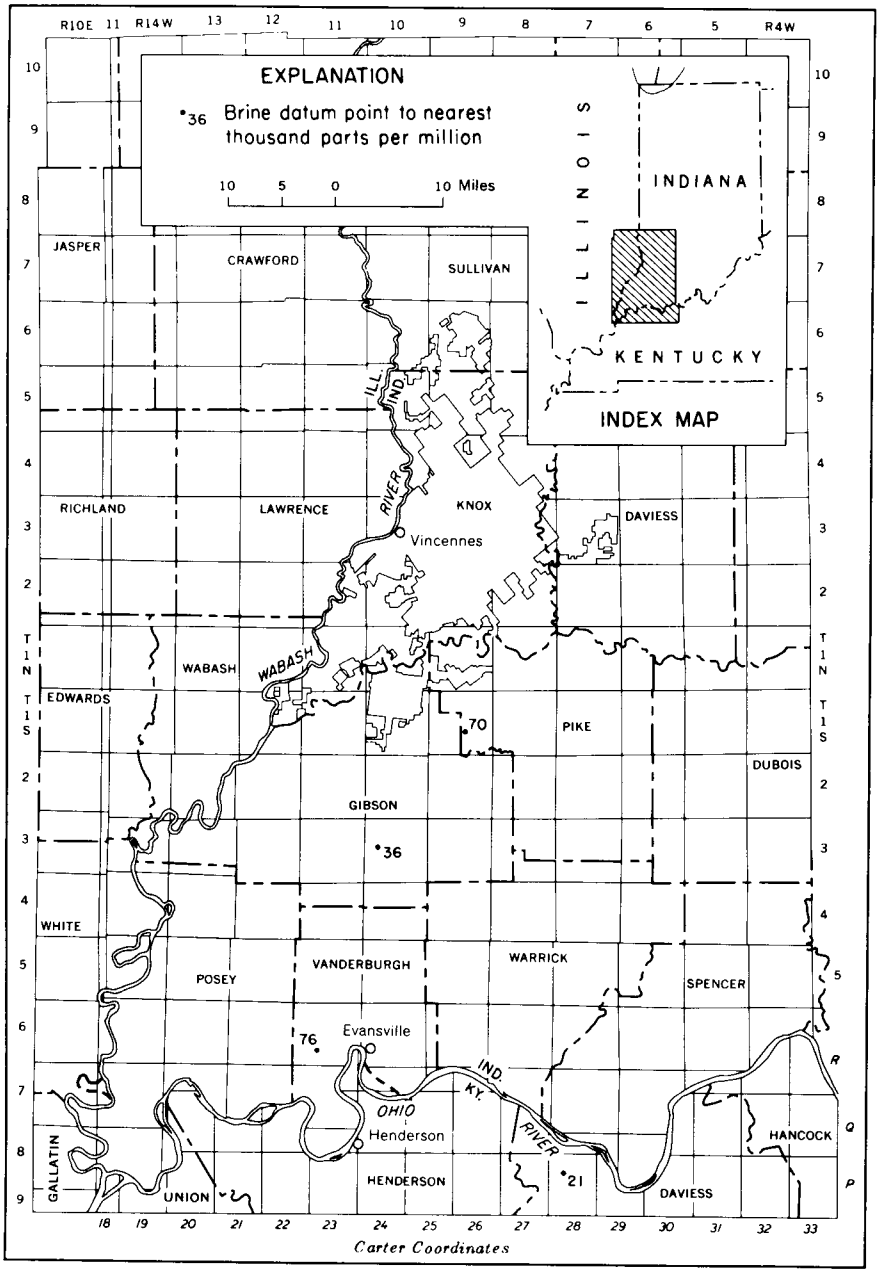

Figure 8. --Map showing total solids in Jackson brines.

TABLE 8. ANALYSES IN PPM OF JACKSON BRINES

LOCATION	DEPTH IN FEET	SP. GR.	PH	TOTAL SOLIDS	NA	K	TOTAL FE	SOL. FE	CA	MG	CL	MCO3	CO3	SO4	EQUIV.* NACL	RES.* 100 F.	SD*
INDIANA																	
GIBSON COUNTY																	
SEC. T. R.																	
17 35 10W	1,766-1,782			35,500?							21,500				35,500	0.14	H
PIKE COUNTY																	
SEC. T. R.																	
27 15 9W	1,275			70,000?							42,500				70,000	0.073	H
VANDERBURGH																	
SEC. T. R.																	
28 6S 11W	2,167-2,183			75,890?											75,900	0.068	H
KENTUCKY																	
DAVIESS COUNTY																	
CARTER COORDINATES																	
7 P 28				20,832?	7,500?	44		1.9	164	102	9,410	412		3,180	19,000	0.24	E

?CALCULATED RESULT, OTHERWISE DETERMINED. EQUIV.* NACL AND REC.* 100 F., SEE TEXT PAGES 9 AND 10, SD* SEE LIST OF SOURCES OF DATA, PAGE 57

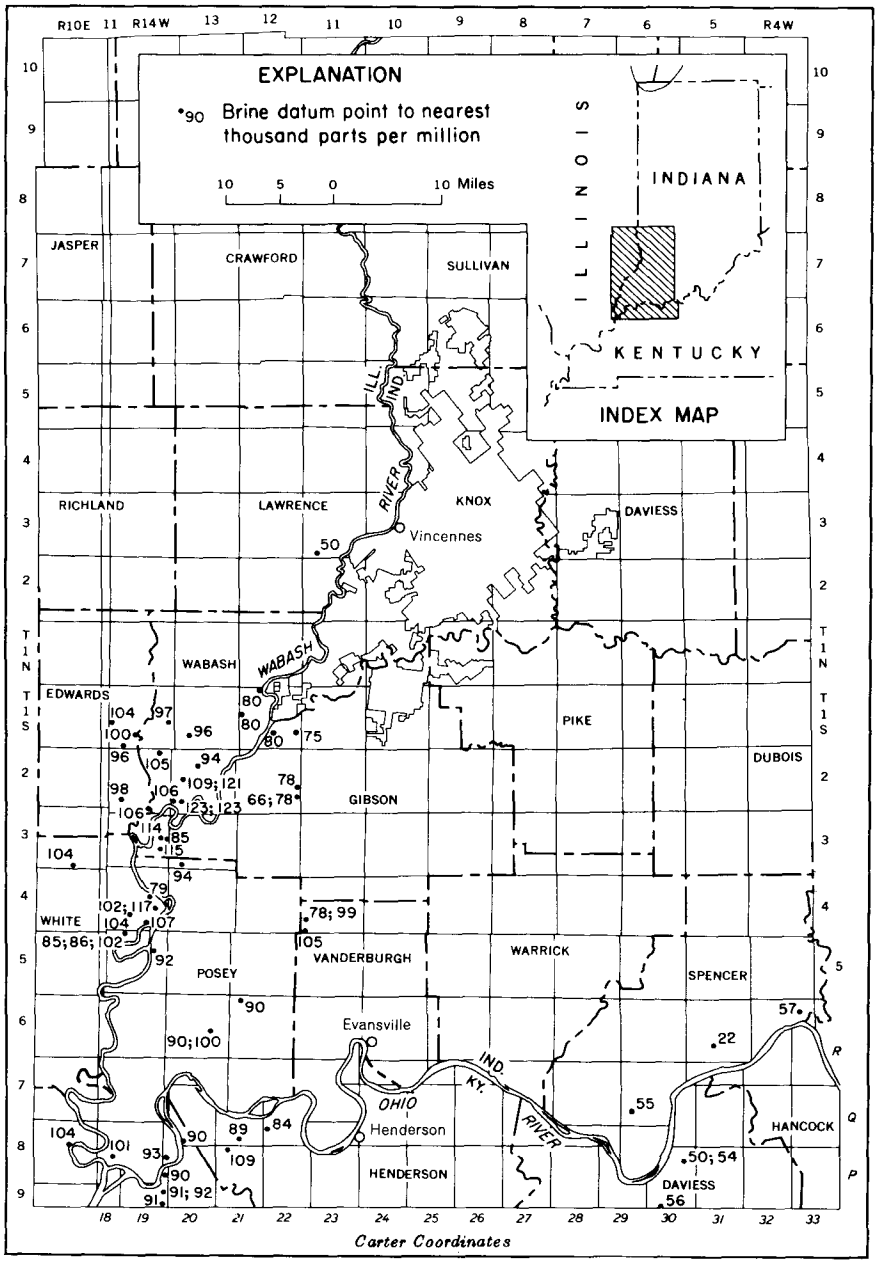

Figure 9. --Map showing total solids in Cypress brines.

TABLE 9. ANALYSES IN PPM OF CYPRESS BRINES

LOCATION			DEPTH IN FEET	SP. GR.	PH	TOTAL SOLIDS	NA	K	TOTAL FE	SOL. FE	CA	MG	CL	MCO3	CO3	SO4	EQUIV.* NACL	RES.* 100 F.	SD*
INDIANA																			
GIBSON COUNTY																			
SEC.	T.	R.																	
25	1S	12W	1,900-2,000	1.052	6.8	74,930?	25,469?		16		2,549	682	44,768	313	0	1,133	74,700	0.069	H
27	1S	12W	1,950	1.055	7.0	79,530?	27,520?			0	2,358	750	48,580	189	0	133	80,000	0.065	H
24	2S	12W	1,955-1,972			77,796?	26,613?		52		2,631	621	46,807	226	0	846	77,600	0.067	H
25	2S	12W	1,866-1,878			77,896?	27,085?		8		2,541	446	46,985	206	0	625	77,700	0.067	H
25	2S	12W	2,070-2,086			66,390?											66,400	0.077	H
13	3S	14W		1.062	6.1	84,744?	28,135?		1.4		3,180	591	48,111			3,281	82,100	0.064	H
14	3S	14W		1.072	6.6	114,136	24,013	89	11		4,824	2,144	63,474	169		55	96,500	0.056	H
23	3S	14W		1.077	6.0	114,533	37,986?		0.7		4,780	1,043	69,167			691	114,000	0.049	H
POSEY COUNTY																			
SEC.	T.	R.																	
32	3S	13W	2,442-2,452			93,910?											93,900	0.057	H
10	5S	14W	2,617-2,671			91,680?											91,700	0.058	H
5	6S	12W	2,400-2,411	1.064		89,612?	29,430?				3,590	970	51,700	82		3,840	88,400	0.060	H
23	6S	13W	2,469-2,488	1.077		100,498?	30,884?				4,948	1,861	59,052	153		3,600	100,000	0.054	H
23	6S	13W	2,527	1.064		89,889?	29,338?				3,256	1,265	51,000	180		4,850	88,400	0.060	H
19	8S	13W	2,284-2,298	1.068		93,343?	32,050?				2,500	942	53,382	444		4,025	91,800	0.058	H
20	8S	14W	2,295-2,305		7.0	101,000	32,000	120	15.9		2,110	899	57,400	158	0	4,070	95,400	0.064#	C
																	# MEASURED VALUE		
SPENCER COUNTY																			
SEC.	T.	R.																	
10	6S	4W	709			57,300?							34,750				57,300	0.088	H
28	6S	5W	948			21,877?	7,490?				564	382	13,070	339		132	22,000	0.21	H
29	7S	6W	1,368-1,375	1.042		55,323?	19,345?				1,418	548	33,796	146		70	55,700	0.090	H
VANDERBURGH COUNTY																			
SEC.	T.	R.																	
30	4S	11W				99,000?							66,000				99,000	0.055	H
30	4S	11W	2,190-2,214	1.062		77,777?	25,260?				2,774	1,251	45,290	451		2,640	77,100	0.067	H
31	4S	11W				105,000?							63,800				105,000	0.052	H
ILLINOIS																			
EDWARDS COUNTY																			
SEC.	T.	R.																	
19	1S	14W	2,703-2,722		6.2	103,942	34,137?		54	42	4,365	933	62,791	61		500	103,000	0.053	F
28	1S	14W	2,632-2,669			100,000?											100,000	0.054	H
32	1S	14W	2,721-2,732			95,860?											95,900	0.056	H
29	2S	14W	2,779-2,794			97,640?											97,600	0.055	H
34	2S	14W	2,624			106,170	35,380?		9.3	0.8	3,995	1,029	64,579	85		43	106,000	0.052	F

?CALCULATED RESULT, OTHERWISE DETERMINED. EQUIV.* NACL AND REC.* 100 F., SEE TEXT PAGES 9 AND 10, SD* SEE LIST OF SOURCES OF DATA, PAGE 57

TABLE 9. ANALYSES IN PPM OF CYPRESS BRINES, CONTINUED

LOCATION			DEPTH IN FEET	SP. GR.	PH	TOTAL SOLIDS	NA	K	TOTAL FE	SOL. FE	CA	MG	CL	MCO3	CO3	SO4	EQUIV.* NACL	RES.* 100 F.	SD*
ILLINOIS CONTINUED																			
GALLATIN COUNTY																			
SEC.	T.	R.																	
15	8S	10E	2,423-2,447		6.8	103,934	36,063?		5.6	0.0	2,258	866	59,093	387		3,843	101,000	0.054	F
LAWRENCE COUNTY																			
SEC.	T.	R.																	
32	3N	11W	1,568-1,593			50,202											50,200	0.099	F
WABASH COUNTY																			
SEC.	T.	R.																	
4	1S	12W	1,990-2,065		6.2	80,390	29,968?		4.0	0.4	2,966	691	48,241	112		808	82,800	0.064	F
18	1S	12W	2,082-2,100			80,000	27,110?		96	48	2,243	809	47,977	96		177	79,000	0.066	F
29	1S	13W	2,546-2,570		6.3	96,430	31,748?		27	2.0	3,570	836	57,516	83		186	94,400	0.057	F
24	1S	14W	2,562-2,566		6.6	97,074	32,091?		20	1.2	3,386	928	58,120	109		5	95,300	0.056	F
9	2S	13W	2,416-2,433			93,800	31,565?		99	28	2,788	1,183	56,781	39		449	93,600	0.057	F
17	2S	13W				121,000?							73,100				121,000	0.047	H
17	2S	13W				109,000?							66,000				109,000	0.050	H
29	2S	13W				123,000?							74,500				123,000	0.046	H
29	2S	13W				123,000?							74,300				123,000	0.046	H
30	2S	13W	2,467-2,492			105,780	34,128?			5.6	4,839	1,030	63,332	207		1,057	105,000	0.052	F
2	2S	14W	2,560-2,570		5.7	104,590	31,456?		16	0.9	6,661	836	61,386	89		1,743	102,000	0.053	F
WHITE COUNTY																			
SEC.	T.	R.																	
34	3S	10E	2,850-2,900			104,425?	34,472?		40		4,488	1,023	63,473	231	0	698	105,000	0.052	H
14	4S	14W	2,591-2,611			79,410?											79,400	0.066	H
23	4S	14W	2,589-2,600			117,030?											117,000	0.048	H
23	4S	14W	2,647-2,670			101,760?											102,000	0.053	H
28	4S	14W	2,597-2,606			104,090?											104,000	0.053	H
34	4S	14W	2,575-2,597			106,645	34,795?		35	7.0	4,500	980	64,498	40		4	106,000	0.052	F
4	5S	14W	2,584-2,588			85,880?											85,900	0.062	H
4	5S	14W	2,586-2,602			84,710?											84,710	0.062	H
4	5S	14W	2,594-2,615			102,360?											102,000	0.053	H
KENTUCY																			
DAVIESS COUNTY																			
CARTER COORDINATES																			
9	P	30	1,200-1,259			54,211?	19,100?				1,235	544	33,210	116		6	54,600	0.092	H
9	P	30	1,223-1,267	1.034		49,912?	17,580?				1,195	481	30,580	67		9	50,300	0.099	H
24	P	30	1,386-1,482			55,673?	19,710?				1,225	525	34,100	79		34	56,100	0.089	H

?CALCULATED RESULT, OTHERWISE DETERMINED. EQUIV.* NACL AND REC.* 100 F., SEE TEXT PAGES 9 AND 10, SD* SEE LIST OF SOURCES OF DATA, PAGE 57

TABLE 9. ANALYSES IN PPM OF CYPRESS BRINES, CONTINUED

LOCATION			DEPTH IN FEET	SP. GR.	PH	TOTAL SOLIDS	NA	K	TOTAL FE	SOL. FE	CA	MG	CL	MCO3	CO3	SO4	EQUIV.* NACL	RES.* 100 F.	SD*
KENTUCY, CONTINUED																			
HENDERSON COUNTY																			
CARTER COORDINATES																			
4	P	21				109,697?	36,390?	3,532		0.1	2,752	1,029	63,040	142		1,812	109,000	0.051	E
23	Q	21	2,304-2,317	1.066		89,011?	29,947?				2,908	950	51,050	166		4,000	87,700	0.060	H
16	Q	22	2,305-2,320	1.064		84,456?	27,782?				3,112	1,061	48,530	171		3,800	83,300	0.063	H
UNION COUNTY																			
CARTER COORDINATES																			
11	P	19	2,169-2,198	1.065		90,060?	30,918?				2,290	935	50,540	377		5,000	88,100	0.060	H
20	P	19	2,178-2,210	1.067		91,758?	31,971?				1,814	970	50,840	363		5,800	89,500	0.059	H
20	P	19	2,275-2,290	1.070	8.1	91,429?	31,575?				2,243	915	51,724	256		4,680	89,700	0.059	H
21	P	19	2,282-2,289	1.068		91,333?	31,409?				2,370	913	51,600	241		4,800	89,600	0.059	H
24	Q	20	2,248	1.066		89,599?	30,426?				2,691	946	51,435	201		3,900	88,300	0.060	H

?CALCULATED RESULT, OTHERWISE DETERMINED. EQUIV.* NACL AND REC.* 100 F., SEE TEXT PAGES 9 AND 10, SD* SEE LIST OF SOURCES OF DATA, PAGE 57

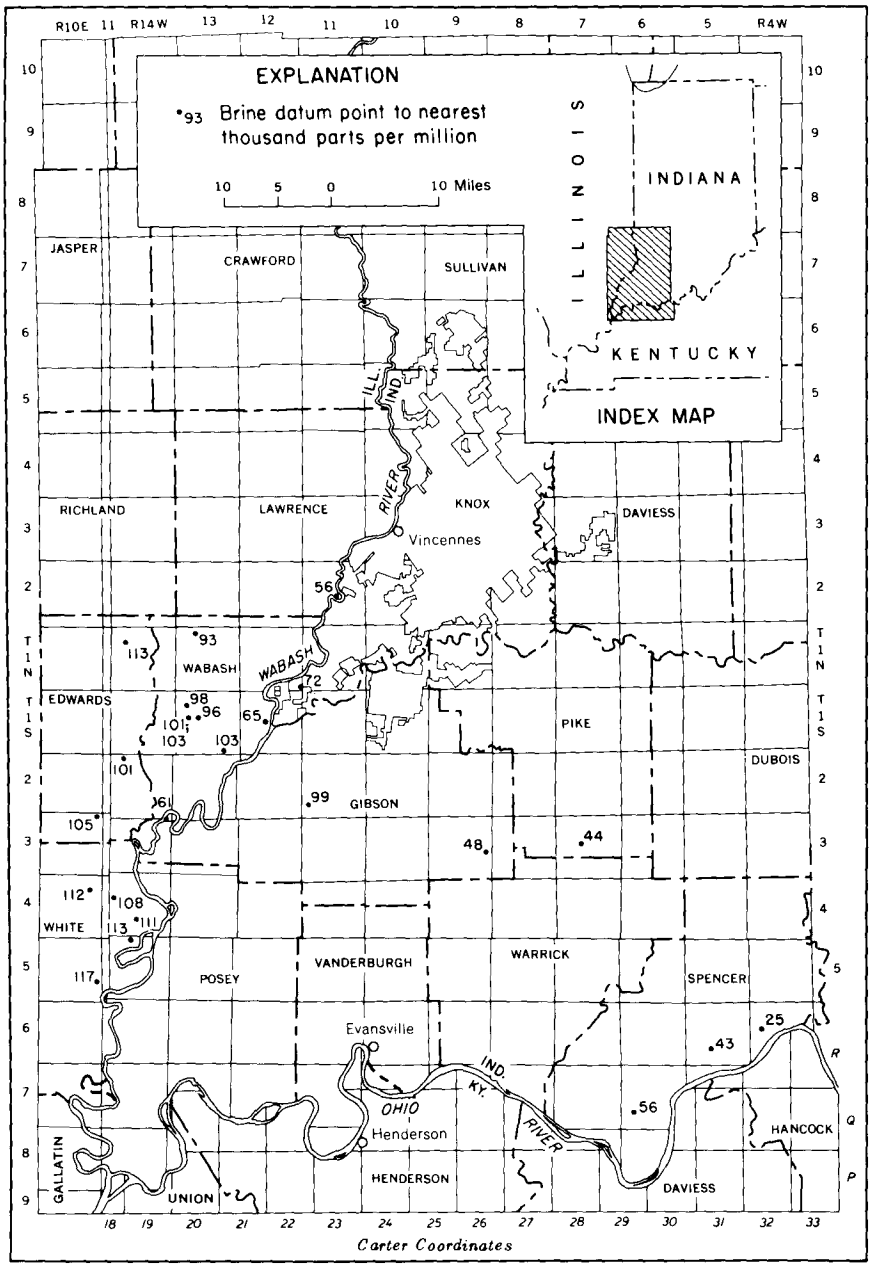

Figure 10. --Map showing total solids in Bethel and and Paint Creek brines.

TABLE 10. ANALYSES IN PPM OF BETHEL AND PAINT CREEK BRINES

LOCATION			DEPTH IN FEET	SP. GR.	PH	TOTAL SOLIDS	NA	K	TOTAL FE	SOL. FE	CA	MG	CL	MCO3	CO3	SO4	EQUIV.* NACL	RES.* 100 F.	SD*
INDIANA																			
GIBSON COUNTY																			
SEC.	T.	R.																	
30	2S	11W	2,109-2,119			99,161?	33,920?		9		3,396	775	59,477	512	0	1,071	98,800	0.055	H
36	2S	14W	2,673-2,674	1.039	7.9	60,800?	17,900?	115	1,150		2,200	720	32,700	105		885	54,700	0.092	H
24	3S	9W	1,465-1,605	1.034		48,127?	16,171?				845	1,109	29,050	781		171	48,500	0.10	H
KNOX COUNTY																			
SEC.	T.	R.																	
36	1N	12W	2,060-2,068	1.054		71,810?	24,680?				2,560	790	42,250	140		1,390	71,700	0.072	H
PIKE COUNTY																			
SEC.	T.	R.																	
16	3S	7W	1,190-1,195	1.036		43,896?	15,538?				870	512	26,695	299		162	44,200	0.11	H
SPENCER COUNTY																			
SEC.	T.	R.																	
17	6S	4W	786---802			25,200?							15,250				25,200	0.19	H
28	6S	5W	1,010	1.048		42,891?	14,190?				969	525	26,660	259		288	43,000	0.11	H
29	7S	6W	1,410-1,422	1.041		56,373?	19,587?				1,393	607	34,302	170		44	56,500	0.090	H
ILLINOIS																			
EDWARDS COUNTY																			
SEC.	T.	R.																	
8	1N	14W	2,800-2,830		5.7	112,512	34,276?		8.0		5,648	1,197	65,724	98		837	108,000	0.051	F
5	2S	14W	2,800-2-830			100,534	17,819?		1.0	0.0	4,940	1,032	65,381	190		1,178	90,600	0.059	F
1	3S	10E	2,834-2,852			104,710?											105,000	0.052	F
LAWRENCE COUNTY																			
SEC.	T.	R.																	
22	2N	11W	1,744-1,772		7.1	56,930	19,579?		10	0.4	1,418	552	33,717	124		770	56,000	0.090	F
WABASH COUNTY																			
SEC.	T.	R.																	
4	1N	13W	2,525-2,552		7.1	92,584	30,137?		40	15	3,974	970	55,756	205		709	92,000	0.058	F
16	1S	12W	2,125			65,116	21,704?			0.0	2,101	709	39,101	123		124	64,300	0.079	F
8	1S	13W	2,550-2,578		6.3	98,150	32,194?		13	7.2	3,897	985	58,505	70		978	96,900	0.055	F
16	1S	13W	2,585-2,608		6.2	96,038	31,630?		70	52	3,927	850	57,105	92		1,470	94,900	0.056	F
17	1S	13W	2,575-2,598		6.8	100,626	32,315?		10	0.0	3,955	932	58,798	122		980	97,300	0.055	F
17	1S	13W	2,606-2,675		6.7	102,740	38,252?		12	8.0	4,320	955	61,531	149		1,217	106,000	0.052	F
35	1S	13W				103,000?							62,700				103,000	0.053	H

?CALCULATED RESULT, OTHERWISE DETERMINED. EQUIV.* NACL AND REC.* 100 F., SEE TEXT PAGES 9 AND 10, SD* SEE LIST OF SOURCES OF DATA, PAGE 57

TABLE 10. ANALYSES IN PPM OF BETHEL AND PAINT CREEK BRINES, CONTINUED

LOCATION			DEPTH IN FEET	SP. GR.	PH	TOTAL SOLIDS	NA	K	TOTAL FE	SOL. FE	CA	MG	CL	MCO3	CO3	SO4	EQUIV.* NACL	RES.* 100 F.	SD*
ILLINOIS, CONTINUED																			
WHITE COUNTY																			
SEC.	T.	R.																	
11	4S	10E	2,906-2,925		5.3	111,500	35,421?		32	24	5,151	1,030	66,048			927	109,000	0.050	F
18	4S	14W	2,795-2,853		5.3	108,400	35,847?		40	30	4,502	1,059	65,197	114		1,523	108,000	0.051	F
28	4S	14W	2,680-2,725			110,876	36,299?		7.0	7.0	4,691	1,040	66,495	264		968	110,000	0.050	F
25	5S	10E	2,824-2,838			116,502	39,446?		20	6.0	3,432	1,110	70,014	183		132	115,000	0.049	F
4	5S	14W	2,724-2,738			112,940?											113,000	0.049	H

?CALCULATED RESULT, OTHERWISE DETERMINED. EQUIV.* NACL AND REC.* 100 F., SEE TEXT PAGES 9 AND 10, SD* SEE LIST OF SOURCES OF DATA, PAGE 57

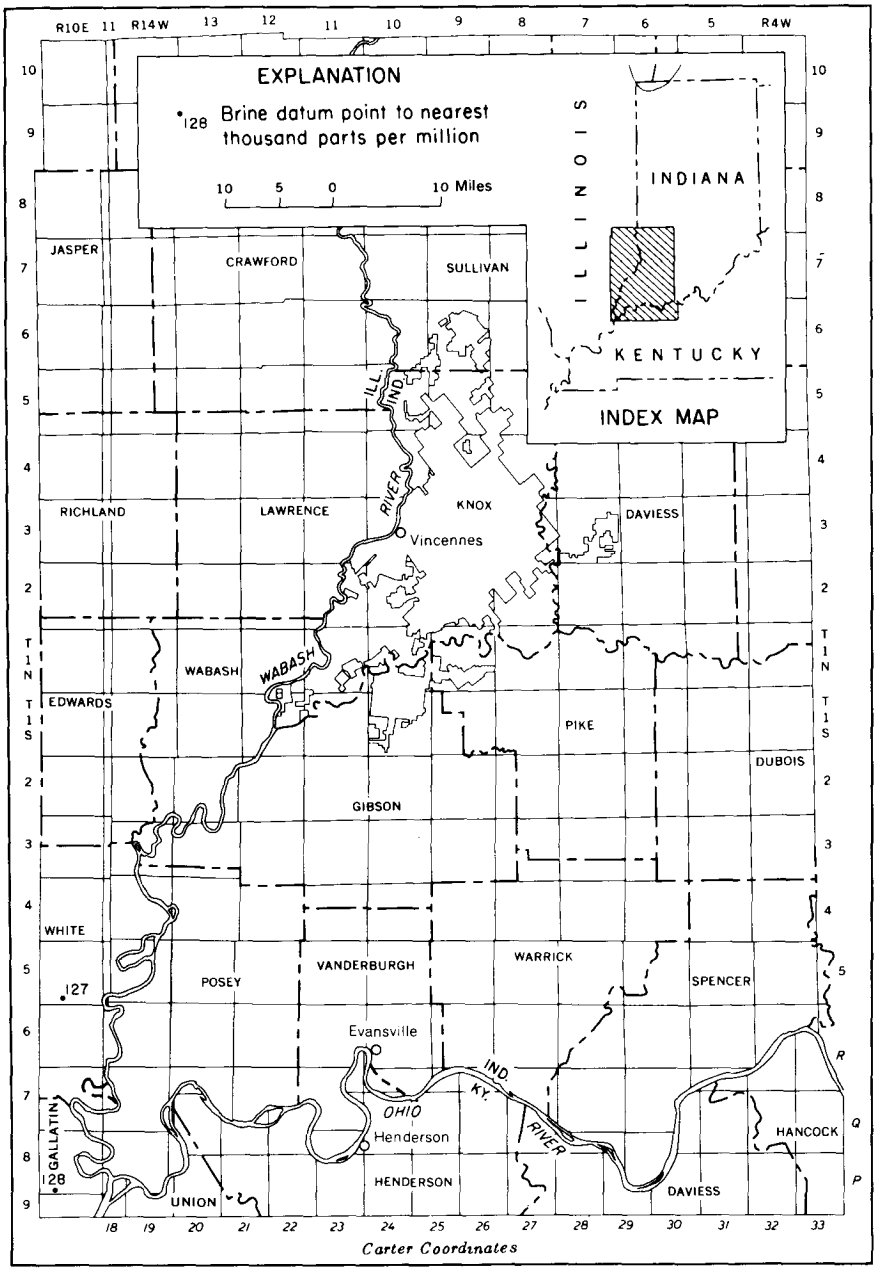

Figure 11. --Map showing total solids in Renault brines.

TABLE 11. ANALYSES IN PPM OF RENAULT BRINES

LOCATION			DEPTH IN FEET	SP. GR.	PH	TOTAL SOLIDS	NA	K	TOTAL FE	SOL. FE	CA	MG	CL	MCO3	CO3	SO4	EQUIV.* NACL	RES.* 100 F.	SD*
ILLINOIS																			
GALLATIN COUNTY																			
SEC.	T.	R.																	
32	8S	10E	2,734-2,759		6.1	127,562	43,245?		32	8.0	3,980	898	74,251	46		2,877	125,000	0.046	F
WHITE COUNTY																			
SEC.	T.	R.																	
32	5S	10E	2,998	1.083	7.0	127,090?	39,600?	132	22		4,800	1,490	71,900	166		1,800	120,000	0.047	H

?CALCULATED RESULT, OTHERWISE DETERMINED. EQUIV.* NACL AND REC.* 100 F., SEE TEXT PAGES 9 AND 10, SD* SEE LIST OF SOURCES OF DATA, PAGE 57

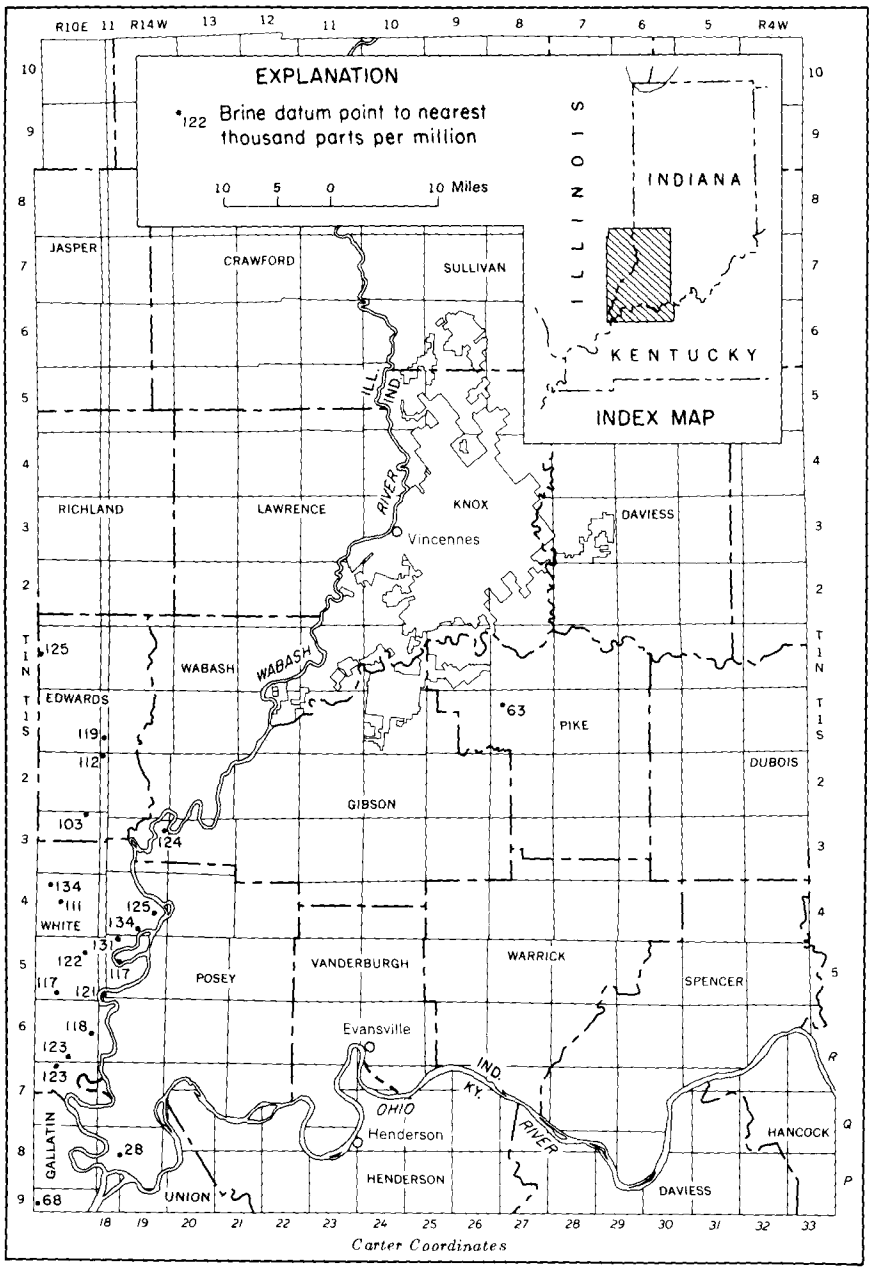

Figure 12. --Map showing total solids in Aux Vases brines.

TABLE 12. ANALYSES IN PPM OF AUX VASES BRINES

LOCATION			DEPTH IN FEET	SP. GR.	PH	TOTAL SOLIDS	NA	K	TOTAL FE	SOL. FE	CA	MG	CL	MCO3	CO3	SO4	EQUIV.* NACL	RES.* 100 F.	SD*
INDIANA																			
GIBSON COUNTY																			
SEC.	T.	R.																	
12	3S	14W	2,762-2,781	1.078	6.9	123,600?	35,300?	125		23	5,330	1,400	67,700	386		1,440	112,000	0.049	H
PIKE COUNTY																			
SEC.	T.	R.																	
8	1S	8W	1,550-1,560	1.046		62,862?	22,300?				192	1,270	36,600	600	300	1,600	63,000	0.080	H
POSEY COUNTY																			
SEC.	T.	R.																	
17	5S	14W	2,909-2,928			116,870?											117,000	0.048	H
36	5S	15W	2,969-3,001	10.86		121,057?	39,922?				4,928	1,319	72,000	88		2,800	121,000	0.047	H
16	8S	14W	2,540-2,578			28,400?							17,200				28,400	0.17	H
ILLINOIS																			
EDWARDS COUNTY																			
SEC.	T.	R.																	
18	1N	10E	3,132-3,172		5.9	125,280	40,575?		14	0.0	6,005	1,130	75,107	78		1,909	125,000	0.046	F
30	1S	11E	3,050-3,261		6.1	119,240	36,894?		30	12	5,805	1,942	71,355	63		2,035	119,000	0.047	F
6	2S	11F	2,994-3,017			117,762											112,000	0.050	F
2	3S	10E	3,144-3,170			102,804	32,526?		10	10	4,870	1,197	60,976	1223		1,775	101,000	0.034	F
GALLATIN COUNTY																			
SEC.	T.	R.																	
7	9S	10E	2,752-2,764			68,300?							41,400				68.300	0.075	H
WHITE COUNTY																			
SEC.	T.	R.																	
8	4S	10E	3,079-3,085			133,586											134,000	0.043	F
16	4S	10E	3,010-3,042			110,000?							67,350				111,000	0.050	H
23	4S	14W	2,832-2,882			125,243	39,764?		14	10	6,006	1,531	75,395	52		1,426	125,000	0.046	F
33	4S	14W				134,000							81,100				134,000	0.043	H
11	5S	10E	2,981-2,991			122,212											122,000	0.047	F
33	5S	10E	3,002-3,027		6.3	116,876	37,783?		12	7.0	5,067	1,049	69,603	58		989	115,000	0.048	F
5	5S	14W	2,845-2,884			130,580?											131,000	0.044	H
24	6S	10E	2,840-2,887		6.7	118,338	40,557?		2.8	0.4	3,515	1,058	69,666	101		2,992	117,000	0.048	F
33	6S	10E	2,900-2,914		6.1	112,974	41,871?		10	3.2	3,914	1,088	72,912	84		238	121,000	0.047	F
4	7S	10E	2,890-2,913		7.4	122,614	41,255?		0.4	0.0	3,898	1,073	71,683	104		2,723	120,000	0.047	F

?CALCULATED RESULT, OTHERWISE DETERMINED. EQUIV.* NACL AND REC* 100 F., SEE TEXT PAGES 9 AND 10, SD* SEE LIST OF SOURCES OF DATA, PAGE 57

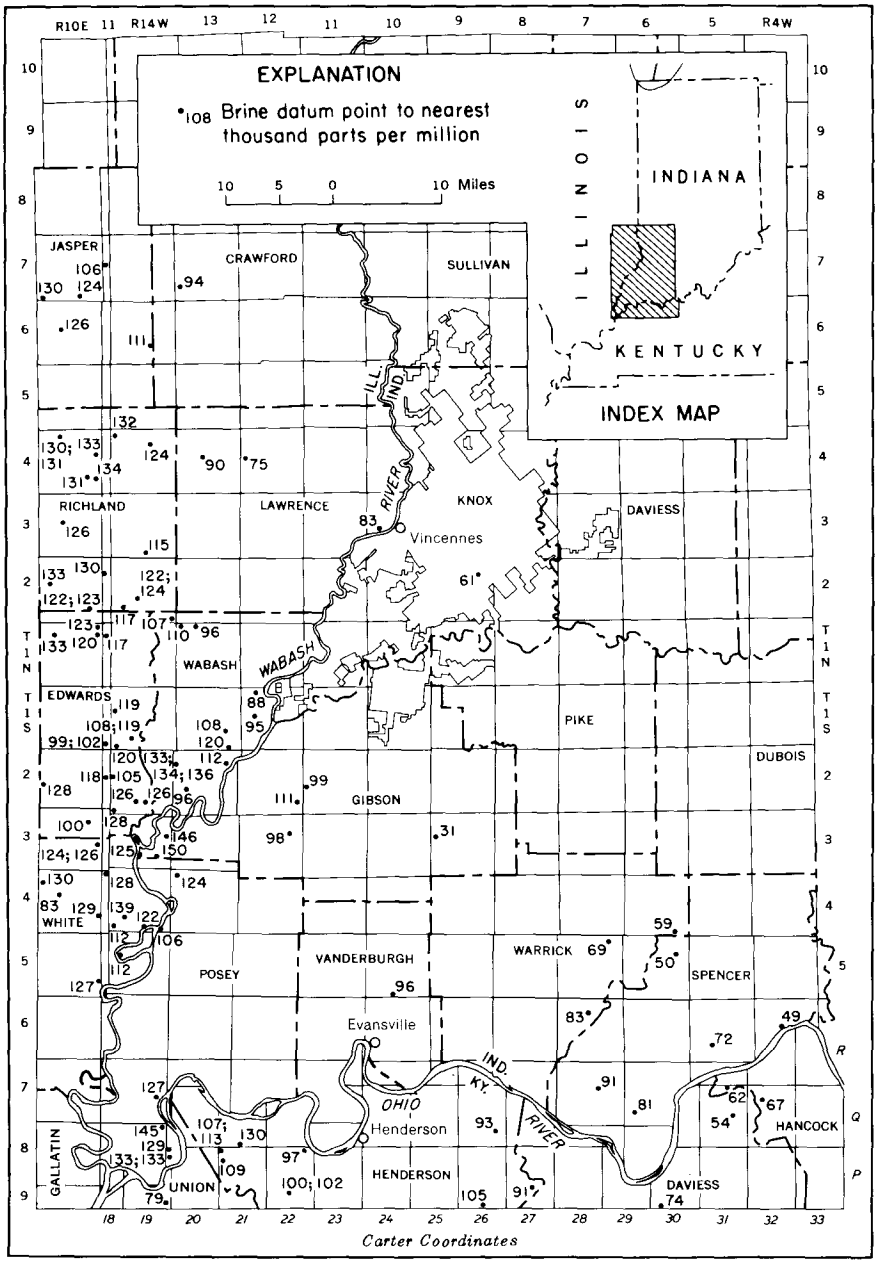

Figure 13. --Map showing total solids in Ste. Genevieve brines.

TABLE 13. ANALYSES IN PPM OF STE. GENEVIEVE BRINES

LOCATION			DEPTH IN FEET	SP. GR.	PH	TOTAL SOLIDS	NA	K	TOTAL FE	SOL. FE	CA	MG	CL	MCO3	CO3	SO4	EQUIV.* NACL	RES.* 100 F.	SD*
INDIANA																			
GIBSON COUNTY																			
SEC.	T.	R.																	
19	2S	11W	2,260-2,266			99,077?	31,363?				4,016	1,925	59,396	489	0	1,888	99,500	0.054	H
25	2S	12W	2,411-2,417			110,600?											111,000	0.050	H
18	3S	9W	1,957-1,980			31,000?							18,800				31,000	0.15	H
11	3S	12W	2,539-2,544	1.066		97,678?	31,639?				5,104	585	57,204	46		3,100	96,400	0.056	H
13	3S	14W		1.088	7.8	146,454?	25,894?	203	15		5,549	3,019	75,937	89		1,349	114,000	0.049	H
26	3S	14W	2,902-2,906	1.092	5.8	149,600?	37,500?	184			9,510	2,380	80,500	277		1,500	133,000	0.043	H
28	3S	14W	2,912-2,916	1.090		124,645?	38,888?				5,425	2,686	76,664	95	27	860	127,000	0.045	H
KNOX COUNTY																			
SEC.	T.	R.																	
11	2N	9W	1,530	1.046		60,780?	19,159?				2,278	1,172	34,269	1,032		2,870	59,600	0.085	H
PROJECTED																			
POSEY COUNTY																			
SEC.	T.	R.																	
6	4S	13W	2,929-2,934	1.089		123,997?	38,500?				5,980	2,236	74,300	131		2,850	124,000	0.046	H
34	4S	14W	2,875-2,901			106,308	35,532?		50	0.4	3,813	1,006	64,498	5	10	7	106,000	0.052	F
17	5S	14W	2,987-3,002			112,350?											112,000	0.050	H
23	7S	14W		1.095		127,318?	42,116?				4,720	1,614	75,600	128		3,140	127,000	0.045	H
18	8S	13W	2,706-2,714	1.092		128,725?	42,987?				4,154	1,853	77,244	112		2,375	129,000	0.044	H
19	8S	13W	2,706-2,718	1.094		132,911?	44,430?				4,344	1,847	79,704	36		2,550	133,000	0.043	H
19	8S	13W	2,706-2,718		6.6	133,000	44,400	329	92.5		4,050	1,720	78,600	36	0	2,590	132,000	0.051#	C
																	# MEASURED VALUE		
1	8S	14W			8.4	145,072?					3,465	2,100	83,050	165	9	2,300	139,000	0.042	H
SPENCER COUNTY																			
SEC.	T.	R.																	
11	5S	6W	1,302-1,313	1.047		50,360?	16,000?				1,893	1,048	30,300	79		1,040	50,700	0.098	H
16	6S	4W	972-1,015			49,100?							29,750				49,100	0.10	H
28	6S	5W	1,203-1,210	1.048		72,053?	23,700?				2,190	1,310	42,680	73		2,100	72,200	0.072	H
29	7S	6W	1,610-1,614	1.060		80,578?	26,389?				2,639	1,398	47,460	92		2,600	80,500	0.065	H
15	7S	7W	1,815-1,820			91,000?							55,150				91,000	0.059	H
VANDERBURGH COUNTY																			
SEC.	T.	R.																	
33	5S	10W	2,341	1.065		95,985?	30,544?				3,528	1,940	56,100	73		3,800	95,800	0.056	H
VIGO COUNTY																			
SEC.	T.	R.																	
16	10N	10W				19,553?	6,806?				212	224	10,000	1,044		1,244	18,400	0.25	H
NOT SHOWN ON FIGURE 13																			

?CALCULATED RESULT, OTHERWISE DETERMINED. EQUIV.* NACL AND REC.* 100 F., SEE TEXT PAGES 9 AND 10, SD* SEE LIST OF SOURCES OF DATA, PAGE 57

TABLE 13. ANALYSES IN PPM OF STE. GENEVIEVE BRINES, CONTINUED

LOCATION			DEPTH IN FEET	SP. GR.	PH	TOTAL SOLIDS	NA	K	TOTAL FE	SOL. FE	CA	MG	CL	MCO3	CO3	SO4	EQUIV.* NACL	RES.* 100 F.	SD*
INDIANA, CONTINUED																			
WARRICK COUNTY																			
SEC.	T.	R.																	
35	4S	6W	1,180-1,183	1.043		59,237?	19,842?				1,537	1,026	34,870	92		1,870	59,200	0.085	H
2	5S	7W	1,418-1,420			69,300?							42,000				69,300	0.074	H
9	6S	7W	1,564-1,565			83,414?	27,400?				2,750	1,374	49,200	354	36	2,300	83,300	0.063	H
ILLINOIS																			
CRAWFORD COUNTY																			
SEC.	T.	R.																	
29	7N	13W				94,000?							57,200				94,000	0.057	H
EDWARDS COUNTY																			
SEC.	T.	R.																	
1	1N	10E	3,201-3,205			123,388											123,000	0.046	F
8	1N	10E	3,274-3,282		7.9	133,254	39,585?		4.0	0.0	5,625	2,719	77,238	870	46	1,644	129,000	0.044	F
12	1N	10E	3,218-3,229		7.1	120,162	36,788?		0.0	0.0	5,041	2,005	69,871		62	2,287	117,000	0.048	F
7	1N	11E	3,205-3,215			116,784											117,000	0.048	F
31	1S	11E	3,134-3,136			98,730?											98,700	0.055	H
31	1S	11E	3,191-3,196			102,360?											102,000	0.054	H
18	1S	14W	3,056-3,065		7.8	119,196	36,836?		2.6	0.0	5,515	2,030	70,836	260	50	2,057	118,000	0.047	F
28	1S	14W	3,003-3,009			108,360?											108,000	0.050	H
28	1S	14W	3,035-3,057			118,830?											119,000	0.047	H
31	1S	14W	3,113-3,123		7.8	120,388	36,686?		10	5.0	6,220	2,079	72,400	120		1,652	120,000	0.047	F
19	2S	10E	3,338-3,351			127,790	37,859?		0.0	0.0	6,508	2,599	76,111	70		1,628	126,000	0.045	F
18	2S	11E	3,145-3,211			117,650?											118,000	0.047	H
18	2S	14W	3,224-3,233			105,260?											105,000	0.052	H
27	2S	14W	2,976-2,998			125,960	37,658?		0.0	0.0	6,336	2,140	74,191	117	16	1,814	123,000	0.046	F
28	2S	14W	3,066-3,080			126,274											126,000	0.045	F
31	2S	14W	3,126-3,190			127,770											128,000	0.044	F
11	3S	10E	3,236-3,257			100,000?											100,000	0.054	H
JASPER COUNTY																			
SEC.	T.	R.																	
16	6N	10E	2,788-2,820			126,428	39,911?		16	0.4	5,563	1,670	74,693	69		2,156	124,000	0.046	F
27	6N	14W	2,682-2,690		7.1	111,182	33,801?		16	0.0	5,034	1,922	65,069	198		2,060	109,000	0.050	F
31	7N	10E	2,853-2,863		6.4	130,204	42,016?		15	0.4	5,606	1,677	78,155	145		2,072	130,000	0.044	F
34	7N	10E	2,648-2,745		5.5	123,972	39,743?		23	11	5,106	1,705	73,798	60		2,100	123,000	0.046	F
18	7N	11E	2,425-2,469		5.9	106,134	33,259?		6.0	0.2	3,880	1,367	61,395	38		829	101,000	0.054	F
LAWRENCE COUNTY																			
SEC.	T.	R.																	
20	3N	10W	1,848-1,882		7.3	82,758	26,643?		0.2	0.0	2,491	1,534	49,426	481		695	82,000	0.064	F
18	4N	12W	1,565-1,588			75,224							43,024				75,200	0.069	F
16	4N	13W	2,261-2,265			90,430	25,534?		1.2	0.0	6,590	1,570	54,286	146		1,519	89,800	0.059	F

?CALCULATED RESULT, OTHERWISE DETERMINED. EQUIV.* NACL AND REC.* 100 F., SEE TEXT PAGES 9 AND 10, SD* SEE LIST OF SOURCES OF DATA, PAGE 57

TABLE 13. ANALYSES IN PPM OF STE. GENEVIEVE BRINES, CONTINUED

LOCATION			DEPTH IN FEET	SP. GR.	PH	TOTAL SOLIDS	NA	K	TOTAL FE	SOL. FE	CA	MG	CL	MCO3	CO3	SO4	EQUIV.* NACL	RES.* 100 F.	SD*
ILLINOIS																			
RICHLAND COUNTY																			
SEC.	T.	R.																	
17	2N	10E	3,178-3,211		7.1	132,722	40,038?		0.6	0.0	6,791	2,237	78,858	89		2,067	131,000	0.044	F
26	2N	10E	3,252-3,257			122,138	35,288?		0	0	5,495	2,071	68,665	313	17	1,769	114,000	0.049	F
26	2N	10E	3,262-3,267			122,948											123,000	0.046	F
7	2N	11E	3,268-3,283		6.8	130,470	38,136?		0.0	0.0	6,413	2,155	75,172	78		1,724	125,000	0.045	F
21	2N	14W	3,066-3,100			124,206											124,000	0.046	F
21	2N	14W	3,049-3,069		6.4	121,670	35,233?		2.4	0.2	6,322	2,282	70,778	49		1,961	118,000	0.048	F
29	2N	14W	3,109-3,131			116,800	35,596?		0.0	0.0	5,603	2.047	68,474	1,175	146	2,184	115,000	0.048	F
16	3N	10E	3,095-3,103		7.4	125,552	39,856?		0.0	0.0	4,064	2,494	74,646	337	48	1,436	124,000	0.046	F
34	3N	14W	3,114-3,129			114,934	36,740?		0.0	0.0	3,965	2,130	69,585	459	122	563	115,000	0.048	F
4	4N	10E	2,889-2,294			130,328											130,000	0.044	F
4	4N	10E	2,890-2,903		6.8	131,146	40,903?		8.0	0.0	5,746	2,043	77,780	68		1,946	129,000	0.044	F
13	4N	10E	3,065-3,082		8.0	132,650?	41,826?		46	0.0	5,770	1,983	78,550	1,048	244	33	130,000	0.044	F
25	4N	10E	3,151-3,162			134,464											134,000	0.043	F
26	4N	10E	3,116-3,132			131,170	40,605?			0.0	6,672	2,131	79,389	374		1,487	131,000	0.044	F
6	4N	14W	3,026-3,041		7.3	132,088	41,408?		0.0	0.0	3,954	2,904	78,979	332	55	243	130,000	0.044	F
10	4N	14W	2,959-2,997			123,984											124,000	0.046	F
WABASH																			
SEC.	T.	R.																	
4	1N	13W	2,670-2,708			95,500	29,870?		8.8	0.4	4,408	1,629	56,523	415	61	2,562	95,300	0.056	F
6	1N	13W	2,801-2,832		7.7	109,734	33,843?		2.4	0.0	4,746	2,119	64,789	429	108	2,311	109,000	0.050	F
36	2N	14W	2,900-2,903		7.6	107,424	33,048?		0.2	0.2	4,024	2,523	64,412	1,175	75	524	107,000	0.051	F
4	1S	12W	2,335-2,355			88,240?											88,200	0.060	H
17	1S	12W	2,325-2,361		7.0	94,770	30,480?		0.0	0.0	2,727	1,927	56,459	1,170	71	321	94,000	0.057	F
26	1S	13W	2,648-2,655			107,640	34,009?		4.0	1.6	4,578	1,972	64,989	586		1,503	108,000	0.050	F
35	1S	13W				120,000?											120,000	0.047	H
7	2S	13W	2,865-2,881			133,068	41,005?			0.0	6,023	2,673	80,510	95		1,609	133,000	0.043	F
7	2S	13W	2,865-2,881		7.3	134,300	40,048?		0.2		6,370	2,210	78,578	56		1,329	130,000	0.044	F
7	2S	13W	2,865-2,881			135,508											136,000	0.043	F
11	2S	13W	2,695-2,714			112,010	34,646?		0.0	0.0	5,275	1,939	67,044	159		1,856	112,000	0.049	F
20	2S	13W	2,939-2,951			96,150?											96,200	0.056	H
WHITE COUNTY																			
SEC.	T.	R.																	
24	3S	10E				124,494											124,000	0.046	F
24	3S	10E	3,140-3,153			126,296											126,000	0.045	F
7	4S	10E	3,206-3,228		8.1	129,834	39,649?		0.0	0.0	5,772	2,026	75,945	81	49	1,785	126,000	0.045	F
16	4S	10E	3,130-3,172			83,300?							50,500				83,000	0.063	H
25	4S	10E	3,074-3,091		7.2	129,100	40,280?		4.0	0.0	5,290	2,313	77,806	60		2,166	129,000	0.044	F

?CALCULATED RESULT, OTHERWISE DETERMINED. EQUIV.* NACL AND REC.* 100 F., SEE TEXT PAGES 9 AND 10, SD* SEE LIST OF SOURCES OF DATA, PAGE 57

TABLE 13. ANALYSES IN PPM OF STE. GENEVIEVE BRINES, CONTINUED

LOCATION			DEPTH IN FEET	SP. GR.	PH	TOTAL SOLIDS	NA	K	TOTAL FE	SOL. FE	CA	MG	CL	MCO3	CO3	SO4	EQUIV.* NACL	RES.* 100 F.	SD*
ILLINOIS, CONTINUED																			
WHITE COUNTY, CONTINUED																			
SEC.	T.	R.																	
6	4S	11E	3,035-3,060		6.3	128,202	37,798?		8.0	0.2	6,211	2,043	73,753	101		2,027	123,000	0.046	F
29	4S	14W	2,975-2,983			139,510?											139,000	0.042	H
31	4S	14W	3,022-3,037			122,320?											112,000	0.049	H
33	4S	14W	3,004-3,010			122,120?											122,000	0.046	H
25	5S	10E	3,022-3,069		5.7	127,024	26,704?		300	200	18,430	1,191	75,857	1,446		854	123,000	0.046	F
KENTUCKY																			
DAVIESS COUNTY																			
CARTER COORDINATES																			
24	P	30	1,644-1,650			72,725?	24,380?				2,130	1,260	44,100	158		1,220	73,700	0.070	H
3	Q	31	1,134-1,139			61,600?							37,350				61,600	0.082	H
12	Q	31	1,390-1,400	1.036		54,173?	17,770?				1,665	987	31,700	131		1,920	54,000	0.092	H
HANCOCK COUNTY																			
CARTER COORDINATES																			
7	Q	32	1,171-1,173			66,636?	21,720?				2,000	1,380	39,800	76		1,660	67,000	0.076	H
HENDERSON COUNTY																			
CARTER COORDINATES																			
5	P	21	2,550-2,572	1.082		113,218?	38,186?				3,738	1,368	68,285	81		1,580	114,000	0.049	H
5	P	21	2,570-2,579	1.078		106,924?	36,338?				3,452	1,096	63,390	98		2,550	107,000	0.051	H
6	P	21	2,559-2,635	1.080		108,907?	35,800?				4,302	1,486	66,840	339		140	110,000	0.050	H
1	P	22	2,537-2,540			97,060?											97,100	0.055	H
18	P	22	2,625	1.072		102,494?	34,000?				2,360	2,340	62,800	354		640	104,000	0.052	H
18	P	22	2,627-2,631	1.070		99,794?	33,600?				1,950	2,184	61,000	460		600	101,000	0.054	H
23	P	26	2,179-2,183			105,448?	33,300?				4,216	2,040	61,900	332		3,660	105,000	0.052	H
18	P	27				91,161?	28,243?				4,264	1,730	54,000	121	8	2,795	91,200	0.058	H
23	Q	21	2,635-2,734	1.093		129,568?	40,230?				6,728		77,869	319		2,400	126,000	0.045	H
19	Q	26	2,019-2,029	1.067		92,944?	29,887?				3,427	1,686	54,500	61	63	3,320	92,800	0.058	H
UNION COUNTY																			
CARTER COORDINATES																			
21	P	19	2,605-2,618	1.060		78,747?	25,328?				2,376	1,908	48,016	159		960	79,900	0.065	H

?CALCULATED RESULT, OTHERWISE DETERMINED. EQUIV.* NACL AND REC.* 100 F., SEE TEXT PAGES 9 AND 10, SD* SEE LIST OF SOURCES OF DATA, PAGE 57

TABLE 14. ANALYSES IN PPM OF SALEM BRINES

LOCATION			DEPTH IN FEET	SP. GR.	PH	TOTAL SOLIDS	NA	K	TOTAL FE	SOL. FE	CA	MG	CL	MCO3	CO3	SO4	EQUIV.* NACL	RES.* 100 F.	SD*
INDIANA																			
DAVIESS COUNTY																			
SEC.	T.	R.																	
3	2N	6W	1,333-1,348			23,500?							14,270				23,500	0.20	H
SULLIVAN COUNTY																			
SEC.	T.	R.																	
3	8N	10W			7.5	34,920?	9,690?		0		2,040	814	20,433	307	0	421	34,014	0.14	H
3	8N	10W			6.2	42,397?	13,198?			0	1,592	989	20,300	521	0	5,800	40,000	0.12	H
ILLINOIS																			
CRAWFORD COUNTY																			
SEC.	T.	R.																	
20	7N	13W				72,000?							43,500				72,000	0.072	H
20	7N	13W			7.0	67,290?	13,500?				2,590	825	23,200	3,825	0	3,260	43,500	0.11	H
20	7N	13W			7.0	57,060?	13,000?				1,860	840	21,200	4,209	0	2,900	40,200	0.12	H
29	7N	13W				85,000?							51,600				85,000	0.062	H
29	7N	13W	1,792-1,816		6.5	73,992	23,700?		0.0	0.0	1,956	1,185	42,441	808		855	71,000	0.072	F
WHITE COUNTY																			
SEC.	T.	R.																	
27	4S	14W	3,741-3,765			199,420?											199,000	0.034	H
27	4S	14W				185,480?											185,000	0.035	H
27	4S	14W	3,756-3,782			175,270?											175,000	0.036	H
33	4S	14W	3,780-3,817			184,000?							111,450				184,000	0.035	H

?CALCULATED RESULT, OTHERWISE DETERMINED. EQUIV.* NACL AND REC.* 100 F., SEE TEXT PAGES 9 AND 10, SD* SEE LIST OF SOURCES OF DATA, PAGE 57

TABLE 15. ANALYSES IN PPM OF BORDEN BRINES

LOCATION			DEPTH IN FEET	SP. GR.	PH	TOTAL SOLIDS	NA	K	TOTAL FE	SOL. FE	CA	MG	CL	MCO3	CO3	SO4	EQUIV.* NACL	RES.* 100 F.	SD*
INDIANA																			
CLARK COUNTY																			
SEC.	T.	R.																	
G234#	1N	5E				14,130?	2,546?				901	1,236	2,472			7,574	11,600	0.39	A
# G INDICATES GRANT																			
CRAWFORD COUNTY																			
SEC.	T.	R.																	
32	2S	1W	1,165			72,700?	26,400	71		91	2,396	560	40,600	3,336		913	71,800	0.072	B
4	3S	1W	690			103,100?	33,800	179		74	2,948	810	52,050	11,250		2,007	94,500	0.057	B
MARTIN COUNTY																			
SEC.	T.	R.																	
19	3N	3W	900			30,410?	8,769	476		15	2,216	47	14,190	678		2,450	27,000	0.18	A

?CALCULATED RESULT, OTHERWISE DETERMINED. EQUIV.* NACL AND REC.* 100 F., SEE TEXT PAGES 9 AND 10, SD* SEE LIST OF SOURCES OF DATA, PAGE 57

TABLE 16. ANALYSES IN PPM OF SILURIAN AND DEVONIAN BRINES

LOCATION			DEPTH IN FEET	SP. GR.	PH	TOTAL SOLIDS	NA	K	TOTAL FE	SOL. FE	CA	MG	CL	MCO3	CO3	SO4	EQUIV.* NACL	RES.* 100 F.	SD*
INDIANA																			
BARTHOLOMEW COUNTY																			
SEC.	T.	R.																	
24	9N	5E	180			1,110	238?				64	44	400	450		101	1,000	3.9	A
ELKHART COUNTY																			
SEC.	T.	R.																	
8	37N	5E	290			13,517?	4,600?	72	0.3		380	133	8,137				13,500	0.34	A
FOUNTAIN COUNTY																			
SEC.	T.	R.																	
35	18N	9W	1,057			11,950?	3,532	104			564	269	6,411	706		674	11,600	0.39	A
7	21N	7W	600			6,680?	2,279				233	64	3,829	451		50	6,600	0.66	A
GREENE COUNTY																			
SEC.	T.	R.																	
20	8N	5W	1,430			73,684?											73,700	0.070	A
HENDRICKS COUNTY																			
SEC.	T.	R.																	
25	15N	2W				7,000?	2,596	31			59	22	3,941	176		9	6,720	0.65	A
HOWARD COUNTY																			
SEC.	T.	R.																	
1	23N	3E	40	1.010		6,870?	1,500				400	200	2,500			1,500	5,900#	0.73	G
																# INCLUDES 370 PPM IODIDE			
KNOX COUNTY																			
SEC.	T.	R.																	
23	1N	10W				143,323	42,746?			0.0	8,952	2,466	88,562	259		426	145,000	0.041	F
LAPORTE COUNTY																			
SEC.	T.	R.																	
30	38N	4W	630			11,580?	2,400	111			1,200	381	5,830	41		1,625	11,100	0.41	A
ORANGE COUNTY																			
SEC.	T.	R.																	
1	1N	1W	1,130			19,900?	4,766			24	1,200	1,100	10,360	48		1,870	19,400	0.24	A
OWEN COUNTY																			
SEC.	T.	R.																	
20	10N	3W				2,070?	490				138	34	993	314	40		2,000	2.0	A
PARKE COUNTY																			
SEC.	T.	R.																	
35	16N	9W	1,200			7,030?	2,406				189	94	3,987	399		86	6,940	0.63	A

?CALCULATED RESULT, OTHERWISE DETERMINED. EQUIV.* NACL AND REC.* 100 F., SEE TEXT PAGES 9 AND 10, SD* SEE LIST OF SOURCES OF DATA, PAGE 57

TABLE 16. ANALYSES IN PPM OF SILURIAN AND DEVONIAN BRINES, CONTINUED

LOCATION			DEPTH IN FEET	SP. GR.	PH	TOTAL SOLIDS	NA	K	TOTAL FE	SOL. FE	CA	MG	CL	MCO3	CO3	SO4	EQUIV.* NACL	RES.* 100 F.	SD*
INDIANA, CONTINUED																			
PERRY COUNTY																			
SEC.	T.	R.																	
17	4S	1W	2,030-2,032	1.081		111,466?	35,265?				4,740	2,052	66,930	119		2,360	112,000	0.049	H
PORTER COUNTY																			
SEC.	T.	R.																	
2	36N	6W	860			5,854	1,404	249			397		2,844	232		161	5,020	0.85	A
1	37N	5W	840		6.9	8,600?	1,650?	185	1		998	300	3,770	391		1,640	8,080	0.55	D
PULASKI COUNTY																			
SEC.	T.	R.																	
13	30N	2W	205			500?	40	55			7	45					NOT CALCULATED		A
SULLIVAN COUNTY																			
SEC.	T.	R.																	
3	8N	10W	2,386-2,401		7.0	84,380?	24,800?		0		5,440	1,933	52,646	512	0	842	87,100	0.063	H
30	9N	8W	2,021-2,025		7.5	11,718	3,625?		0.4	0.0	446	203	6,594	678		7	11,200	0.40	F
19	9N	9W			7.3	18,278	5,315?		0.4	0.0	969	323	10,363	642		226	17,500	0.26	F
5	9N	10W	2,518-2,187		7.1	29,142	8,847?		0.8	0.0	1,182	528	17,096	305		77	28,200	0.17	F
13	9N	10W		1.024	6.6	33,000?	7,130?				2,354	679	17,137				27,900	0.17	H
20	9N	10W	2,556			59,473?	17,900?				3,120	1,220	36,300	165		768	60,000	0.084	H
TIPPECANOE COUNTY																			
SEC.	T.	R.																	
20	23N	4W	217	1.005		7,300?	2,185?				387	131	3,787	256		676	7,010	0.62	A
VERMILLION COUNTY																			
SEC.	T.	R.																	
2	15N	9W	1,232-1,235			7,700?							4,670				7,700	0.57	H
VIGO COUNTY																			
SEC.	T.	R.																	
15	10N	10W	2,022-2,171			14,010	4,483?			0.0	500	260	8,241	569		12	13,900	0.33	F
15	10N	10W	2,089			18,117							10,078				18,100	0.26	F
15	10N	10W	2,115			18,686							10,653				18,700	0.25	F
15	10N	10W	2,115-2,168			14,033	4,715?			0.0	675	237	8,761	606		58	14,800	0.31	F
16	10N	10W	2,094			15,898							9,312				15,900	0.29	F
16	10N	10W	2,103-2,190			13,538							7,811				13,500	0.34	F
32	10N	10W	2,218	1.018		24,734	7,840?				953	494	14,892	500		55	24,800	0.19	H
24	11N	8W	1,612-1,641		7.5	3,840	1,390?		0.0	0.0	51	52	2,018	631		25	3,740	1.1	F
11	11N	9W	1,681-1,704		7.6	6,184	2,010?			0.0	224	85	3,273	819		4	5,890	0.73	F
11	11N	9W	1,782-1,810			4,938	1,706?		2.8	0.0	152	0	2,773		55	91	4,470	0.92	F

?CALCULATED RESULT, OTHERWISE DETERMINED. EQUIV.* NACL AND REC.* 100 F., SEE TEXT PAGES 9 AND 10, SD* SEE LIST OF SOURCES OF DATA, PAGE 57

TABLE 16. ANALYSES IN PPM OF SILURIAN AND DEVONIAN BRINES, CONTINUED

LOCATION			DEPTH IN FEET	SP. GR.	PH	TOTAL SOLIDS	NA	K	TOTAL FE	SOL. FE	CA	MG	CL	MCO3	CO3	SO4	EQUIV.* NACL	RES.* 100 F.	SD*
INDIANA, CONTINUED																			
VIGO COUNTY, CONTINUED																			
SEC.	T.	R.																	
21	12N	9W	1,800-1,912			6,980?	2,339	36			214	108	3,995	517		3	6,930	0.63	A
22	12N	9W	1,783-1,793			5,990?	2,128	11			147	46	3,422	420		28	5,920	0.73	A
22	12N	9W	1,800			6,030?	2,027	32		0.2	177	92	3,436	476		3	5,980	0.72	A
13	13N	9W	1,537-1,541	1.007		21,793?	8,030?				221	143	12,750	721		228	21,500	0.22	H
ILLINOIS																			
CRAWFORD COUNTY																			
SEC.	T.	R.																	
9	6N	13W	2,795-2,965			72,972	22,912?		2.0	0.0	2,757	1,192	40,966	546		3,375	70,700	0.072	F
WHITE COUNTY																			
SEC.	T.	R.																	
27	4S	14W	4,978-5,011			43,000?											43,000	0.11	H
KENTUCKY																			
HENDERSON COUNTY																			
CARTER COORDINATES																			
SEC.	T.	R.																	
22	Q	25	4,290			169,710	50,710?		2.0		8,306	2,271	100,034	112		466	163,000	0.038	F
22	Q	25	4,030	1.12		166,953?	51,400?				8,980	2,730	102,700	793		350	168,000	0.037	E

?CALCULATED RESULT, OTHERWISE DETERMINED. EQUIV.* NACL AND REC.* 100 F., SEE TEXT PAGES 9 AND 10, SD* SEE LIST OF SOURCES OF DATA, PAGE 57

TABLE 17. ANALYSES IN PPM OF TRENTON BRINES

LOCATION			DEPTH IN FEET	SP. GR.	PH	TOTAL SOLIDS	NA	K	TOTAL FE	SOL. FE	CA	MG	CL	MCO3	CO3	SO4	EQUIV.* NACL	RES.* 100 F.	SD*
INDIANA																			
ALLEN COUNTY																			
SEC.	T.	R.																	
7	3N	13E		1.04		67,500?	20,270	31		174	4,205	1,148	32.990	12,870		2,210	64,200	0.079	A
CARROLL COUNTY																			
SEC.	T.	R.																	
29	25N	2W				569?	154				5	7	341	15		0.1	518	7.4	A
CASS COUNTY																			
SEC.	T.	R.																	
26	27N	1E	1,100			19,400?	5,333?				1,259	505	9,222	2,233		1,900	18,300	0.25	A
DEARBORN COUNTY																			
SEC.	T.	R.																	
32	5N	1W				9,650?											9,650	0.46	A
JAY COUNTY																			
SEC.	T.	R.																	
25	22N	12E	1,012-1,014			39,674?	13,130?				462	1,210	24,300	192		380	40,500	0.12	H
MADISON COUNTY																			
SEC.	T.	R.																	
1	19N	6E	803			15,499?	5,270?				328	243	9,040	528		90	15,300	0.30	H
RUSH COUNTY																			
SEC.	T.	R.																	
29	15N	9E				119,262?											119,000	0.047	A
TIPTON COUNTY																			
SEC.	T.	R.																	
21	21N	3E	999-1,010			5,905?	1,545?				422	173	3,440	265		60	5,830	0.74	H

?CALCULATED RESULT, OTHERWISE DETERMINED. EQUIV.* NACL AND REC.* 100 F., SEE TEXT PAGES 9 AND 10, SD* SEE LIST OF SOURCES OF DATA, PAGE 57

TABLE 18. ANALYSES IN PPM OF BLACK RIVER BRINES

LOCATION			DEPTH IN FEET	SP. GR.	PH	TOTAL SOLIDS	NA	K	TOTAL FE	SOL. FE	CA	MG	CL	MCO3	CO3	SO4	EQUIV.* NACL	RES.* 100 F.	SD*
INDIANA																			
MONROE COUNTY																			
SEC.	T.	R.																	
29	8N	1E	2,252-2,259			17,022?	4,200?				1,256	582	8,900	214		1,870	16,400	0.28	H
TIPTON COUNTY																			
SEC.	T.	R.																	
21	21N	3E	1,215			7,656?	2,180?				391	223	4,430	332		100	7,570	0.58	H

?CALCULATED RESULT, OTHERWISE DETERMINED. EQUIV.* NACL AND REC.* 100 F., SEE TEXT PAGES 9 AND 10, SD* SEE LIST OF SOURCES OF DATA, PAGE 57

TABLE 19. ANALYSES IN PPM OF CHAZYAN BRINES

LOCATION			DEPTH IN FEET	SP. GR.	PH	TOTAL SOLIDS	NA	K	TOTAL FE	SOL. FE	CA	MG	CL	MCO3	CO3	SO4	EQUIV.* NACL	RES.* 100 F.	SD*
INDIANA																			
CASS COUNTY																			
SEC.	T.	R.																	
11	28N	1W	1,358-1,361			14,863?	3,740?				1,255	307	7,200	310		2,050	13,900	0.33	H
JACKSON COUNTY																			
SEC.	T.	R.																	
11	5N	2E	2,403-2,410	1.011		15,387?	4,590?				740	296	8,200	601		960	14,700	0.31	H
MADISON COUNTY																			
SEC.	T.	R.																	
1	19N	6E	1,285-1,325	1.009		12,817?	3,660?				391	466	6,880	1,168		252	12,300	0.37	H
MARION COUNTY																			
SEC.	T.	R.																	
9	15N	3E		1.011		16,000?	4,351?				777	730	9,613	1,016		16	16,400	0.28	A
MONROE COUNTY																			
SEC.	T.	R.																	
29	8N	1E	2,373			17,175?	4,725?				1,030	464	9,250	376		1,330	16,600	0.28	H
29	8N	1E	2,373-2,379			17,503?	4,591?	236	12		901	405	8,812		120	1,509	16,100	0.29	C
ORANGE COUNTY																			
SEC.	T.	R.																	
29	3N	2W	3,222-3,226	1,020		27,444?	8,260?				1,220	632	15,200	232		1,900	26,900	0.18	H
ILLINOIS																			
CRAWFORD																			
SEC.	T.	R.																	
35	6N	13W	4,650-4,654		6.3	160,730?	44,295?		0.4	0.0	11,260	2,306	94,257	110		945	54,000	0.039	F

?CALCULATED RESULT, OTHERWISE DETERMINED. EQUIV.* NACL AND REC.* 100 F., SEE TEXT PAGES 9 AND 10, SD* SEE LIST OF SOURCES OF DATA, PAGE 57

TABLE 20. ANALYSES IN PPM OF KNOX BRINES

LOCATION			DEPTH IN FEET	SP. GR.	PH	TOTAL SOLIDS	NA	K	TOTAL FE	SOL. FE	CA	MG	CL	MCO3	CO3	SO4	EQUIV.* NACL	RES.* 100 F.	SD*
INDIANA																			
MONROE COUNTY																			
SEC.	T.	R.																	
29	8N	1E	2,439-2,443			17,088?	4,652?	267	9		873	377	8,789		125	1,284	16,000	0.29	C
29	8N	1E	2,489			16,343?	4,778?	369	6		711	296	9,133		177	671	15,900	0.29	C
TIPTON COUNTY																			
SEC.	T.	R.																	
21	21N	3E	1,512-1,520	1.004		6,637?	2,025?				182	185	3,610	601		25	6,350	0.68	H

?CALCULATED RESULT, OTHERWISE DETERMINED. EQUIV.* NACL AND REC.* 100 F., SEE TEXT PAGES 9 AND 10, SD* SEE LIST OF SOURCES OF DATA, PAGE 57

SOURCES OF DATA

A Blatchley, W. S. , 1903, Twenty-sixth annual report of the Indiana Department of Geology and Natural Resources, 1901: 448 p. , 26 pls. , 22 figs.

B Cox, E. T. , 1879, Eighth, ninth, and tenth annual reports of the Geological Survey of Indiana, made during the years 1876-77-78: 541 p. , 25 figs. , 4 maps.

C Indiana Geological Survey, Petroleum Section files.

D Krieger, R. A., Hatchett, J. L., and Poole, J. L, 1957, Preliminary survey of the saline-water resources of the United States: U. S. Geol. Survey Water-Supply Paper 1374, 172p., 2 pls., 3 figs., 7 tables.

E McGrain, Preston, 1953, Miscellaneous analyses of Kentucky brines: Ky. Geol. Survey, ser. 9, Rept. Inv. 7, 16 p. , 4 figs.

F Meents, W. F. , Bell, A. H. , Rees, O. W. , and Tilbury, W. G. , 1952, Illinois oilfield brines: Ill. Geol. Survey Ill. Petroleum 66, 38 p., 13 figs., 1 table.

G Thompson, Maurice, 1886, Fifteenth annual report of the Indiana Department of Geology and Natural History, 1886: 359p. , 1 pl.

H Tri-State Association of Petroleum Engineers.

LITERATURE CITED

Dunlap, H. F. , and Hawthorne, R. R. , 1951, The calculation of water resistivities from chemical analyses: Jour. Petroleum Technology, v. 3, no. 3, p. 17 (sec. 1) and p. 7 (sec. 2), 1 fig. , 2 tables. (Tech. Note 67).

Guyod, Hubert, 1945, Electrical well logging fundamentals: 103 p., Duncan, Okla. , Halliburton Oil Well Cementing Co.

National Research Council, 1929, International critical tables, v. 6: New York, McGraw-Hill Book Co., Inc.

Wyllie, M. R. J. , 1957, The fundamentals of electric log interpretation, 2d ed.: 176 p. , illus. , New York, Academic Press, Inc.